VPDES PERMIT FACT SHEET

This document gives pertinent information concerning the reissuance of the VPDES permit listed below. This permit is being processed as a major, municipal permit. The effluent limitations contained in this permit will maintain the Water Quality Standards of 9 VAC 25-260-00 *et seq*. The discharge results from the operation of the Town of Christiansburg's Wastewater Treatment Facility. This permit action consists of reissuing the permit for a period of 5 years and reestablishing effluent limits for pH, biochemical oxygen demand (BOD_5), total suspended solids (TSS), dissolved oxygen (DO) and *E. coli*, reestablishing conditions for the land application of biosolids, and updating boilerplate language. SIC Code: 4952 - Sewerage Systems

1. **FACILITY NAME AND ADDRESS:**
   Town of Christiansburg Wastewater Treatment Facility (WWTF)
   100 East Main Street
   Christiansburg, VA 24073
   LOCATION: 2557 Crab Creek Road, Montgomery County

2. **PERMIT NUMBER:** VA0061751
   EXISTING PERMIT EXPIRATION DATE: September 25, 2010

3. **OWNER CONTACT**

Name:	Barry D. Helms
Title:	Interim Town Manager
Telephone:	(540) 382-6128

4. **APPLICATION COMPLETE DATE:** February 3, 2010
   PERMIT DRAFTED BY: Bob Tate **DATE:** June 22, 2010 Blue Ridge Regional Office
   REVIEWED BY: Kip Foster **DATE:** July 19, 2010 Blue Ridge Regional Office
   PUBLIC COMMENT PERIOD DATES: from August 19, 2010 to September 17, 2010

5. **RECEIVING WATERS:**

Receiving Stream:	New River
River Mile:	77.64
Basin:	New River
Subbasin:	N/A
Section:	2a
Class:	IV
Special Standards:	PWS, v
1-day, 30-year low flow (1Q30):	441 MGD*
1-day, 10-year low flow (1Q10):	467 MGD*
7-day, 10-year low flow (7Q10):	577 MGD*
30-day, 10-year low flow (30Q10):	663 MGD
30-day, 5-year low flow (30Q5):	741 MGD*
1-day, 10-year high flow (HF1Q10):	546 MGD* (January through May)
7-day, 10-year high flow (HF7Q10):	786 MGD* (January through May)
30-day, 10-year high flow (HF30Q10):	1,079 MGD* (January through May)
Harmonic Mean flow (HM):	1,527 MGD*
Tidal?	No
On 303(d) list?	Yes – PCBs in fish tissue

*flow frequency documentation is in APPENDIX C

6. **OPERATOR LICENSE REQUIREMENT:** Class I

7. **RELIABILITY CLASS:** I

8. **PERMIT CHARACTERIZATION:**
( ) Private ( ) Federal ( ) State (X) POTW ( ) PVOTW
( ) Possible Interstate Effect ( ) Interim Limits in Other Document

9. **WASTEWATER TREATMENT SYSTEM:** A process schematic/flow diagram is in APPENDIX B, which also includes the site visit report. The site visit report contains more detailed information.

The original facility went on line in May, 1980 at 2.0 MGD design capacity. Discharge was to Crab Creek. In 1987 the facility expanded to 3.0 MGD design flow, discharging to Crab Creek. In 1998 the facility began discharging to the New River through an in-stream diffuser. In 2001 the facility expanded to 4.0 MGD design flow. A PER to expand to 6.0 MGD was approved by DEQ in November 2004. A certificate to operate (CTO) at 6.0 MGD design flow was issued August 25, 2010. It is anticipated the facility will expand to 8.0 MGD and possibly 10.0 MGD.

Major wastewater treatment operations include pretreatment, flow equalization, primary settling, secondary treatment (activated sludge and settling), disinfection (UV), and post aeration. Treated wastewater is pumped from the WWTF through approximately 20,000 feet of 24-inch force main to Outfall 001, a diffuser in the New River. More detailed operations descriptions are in the site visit report (APPENDIX B).

The application identifies three outfalls, only one of which (001) is established in the permit's effluent limitations pages (Part I.A). Outfall 002 (equalization basin overflow) can allow overflows to be discharged to Crab Creek from the equalization basins (total capacity 2.88 million gallons). Effluent from 002 would go though screening and grit removal processes. No discharges have occurred at 002 since the WTF expansion began in the year 2000. Outfall 006 (effluent pump station) is another discharge point to Crab Creek in emergency situations. Effluent from 006 would be metered and would receive complete treatment through the wastewater treatment facility. No discharges have occurred at 006 since the WTF expansion began in the year 2000. Any discharges from 002 or 006 must be reported according to Permit Part II.U (per Permit Manual Section MN-3 D).

10. **SEWAGE SLUDGE USE OR DISPOSAL:** Sludge is thickened by a gravity belt thickener, stabilized by anaerobic digestion, stored at the facility. A schematic diagram is in APPENDIX B. The treated sludge (biosolids) is land applied to local farm land for their nutrient value under the responsibility of the Town according to the Sludge Management Plan (SMP) submitted with the application. The SMP indicates that biosolids will be applied infrequently (once every three years) and not exceeding the nitrogen agronomic rate, or at frequent below agronomic rates for dedicated pasture (<50% of the agronomic rate), to each land application site. The biosolids meet the maximum monthly average pollutant concentration (PC) requirements in Table 3 of 9 VAC 25-31-540, achieves Class B pathogen reduction by anaerobic digestion, and vector attraction reduction through a minimum 38% reduction in volatile solids. The New River Resource Authority Landfill (Permit 548) in Pulaski County is a sludge disposal option.

11. **DISCHARGE LOCATION DESCRIPTION:** APPENDIX A contains a copy of a topographic map included with the permittee's application indicating the facility and outfall locations. Outfall 001 discharges to the New River (Water Body ID# VAW-N18R) at river mile 77.64, and can be found on the USGS Radford North quadrangle. Latitude/longitude of the discharge is: N 37° 08' 51", E 80° 31' 33". The discharge pipe is a submerged multiport diffuser in the New River located approximately 500 feet upstream of Crab Creek's mouth. The 24 inch diameter diffuser is 90 feet long and positioned 93 feet from the east bank perpendicular to the stream. The diffuser has 36 four-inch ports; currently half are open and half are closed.

12. **MATERIAL STORAGE:** Chemicals stored at the STP include diesel fuel (capacity 5,000 gallons), unleaded gasoline (capacity 300 gallons), polymers, HTH, caustic, lime, and small quantities of cleaning chemicals and paint. Waste oil is not stored at the facility but is collected in 5 gallon drums and taken to be recycled off site.

13. **AMBIENT WATER QUALITY INFORMATION:** The receiving water body is the New River, which is within Section 2a of the New River basin as listed in the State Water Control Board's Water Quality Standards (WQS), River Basin Section Tables (9 VAC 25-260-540). The receiving stream is Class IV with special standards for public water supplies (PWS) and temperature (v). Class IV (mountain zones waters) criteria in 9 VAC 25-260-50 are as follows:

DO 4.0 mg/L (minimum) and 5.0 mg/L (daily average);
pH 6.0 - 9.0;
temperature 31°C (maximum).

Special standard v (9 VAC 25-260-310 v) establishes a maximum temperature of 29°C which supercedes the Class IV criterion of 31°C (maximum). Special standard v applies to the New River from the Montgomery-Giles County line to the Virginia-North Carolina border.

The river is impaired for PCBs in fish tissue. APPENDIX C contains the impairment fact sheet.

A revised Flow Frequency Determination Memorandum (March 8, 2010) has been prepared for this facility (APPENDIX C). Flow determinations were made using a continuous record gage on the New River at Radford, Virginia (#3171000), which has been operated by the USGS since 1939. A conservative approach was chosen for flow frequency analyses. The approach assumes only New River flow is available for mixing. Crab Creek flow is not included. Crab Creek flow into the New River is complicated because flow is divided between the New River and a parallel channel that combines with the river approximately 2000 feet downstream of the creek's mouth. The discharge pipe is a submerged multiport diffuser in the New River located approximately 500 feet upstream of Crab Creek's mouth. Thus complete flow from Crab Creek is not available for mixing until approximately 2500 feet downstream of the diffuser. This was observed at the March 31, 2010 site visit and can be verified with topographic maps and aerial photos. More significant, CORMIX diffuser modeling in 2005 indicated complete mixing for 4.0, 6.0 and 8.0 MGD effluent discharges. Therefore Crab Creek flow is not needed for diffuser mixing considerations.

The original Flow Frequency Determination Memorandum (August 12, 1996) for discharge to the New River was written by Paul Herman, WQAP. Crab Creek flows were determined using regression analysis and 1982-1985 flow measurements taken at Neck Creek at the Route 617 Bridge near Belspring. The previous Flow Frequency Determination Memorandum (January 27, 2005) used improved regression analysis for determining Crab Creek flows. The analysis was based on Crab Creek flow measurements from 1995 to 2003. This superior Crab Creek flow determination methodology could have future uses so a copy is included in APPENDIX C.
Receiving stream data for the Water Quality Criteria/Waste Load Allocation Analysis spreadsheets were obtained from STORET monitoring station 9-NEW081.72 at the Route 11 Bridge in Radford. Data and calculations are in APPENDIX C.

A Federal Energy Regulatory Commission (FERC) relicensing study report for American Electric Power's Claytor Project indicated relatively low dissolved oxygen (DO) and relatively high temperatures in the New River upstream of the discharge. DO and temperature data collected weekly at river mile 78.97 near Plum Creek from June 20 through October 24, 2007 were used in dissolved oxygen modeling (only). Data and calculations are in APPENDIX I.

14. **ANTIDEGRADATION REVIEW AND COMMENTS:** Tier II

The State Water Control Board's Water Quality Standards (WQS), 9 VAC 25-260-00 *et seq*, provide all state surface waters one of three levels of antidegradation protection. For Tier I, existing uses of the water body and the water quality must be maintained. A Tier II water body has water quality that is better than the narrative and numeric water quality criteria. Significant lowering of the water quality of a Tier II water is not allowed without an evaluation of the economic and social impacts, as required by 9 VAC 25-260-30 of the WQS. A Tier III water body is an exceptional water body that is designated by regulation. The antidegradation policy prohibits new or expanded discharges into exceptional waters.

The antidegradation review begins with the Tier determination. The receiving segment is listed for a PCB impairment. A 2008 Impaired Waters fact sheet (in APPENDIX C) indicates the receiving segment of the New River is impaired for "PCB in Fish Tissue" and not supporting the fish consumption use. Because the impairment is determined by PCBs in fish tissue rather than PCBs in the water column, Tier is II is appropriate. As a Tier II water body, significant lowering of the water quality is not allowed without an evaluation of the economic and social impacts. Lowering the water quality of the New River could have a significant impact because the Blacksburg-Christiansburg-VPI Water Authority's drinking water intake is approximately 2 miles downstream of the WWTF discharge. Section 2a, which contains the receiving segment, is designated as a Public Water Supply (PWS) in 9 VAC 25-260-540 of the WQS.

For purposes of aquatic life protection, "significant degradation" means that no more that 25% the difference between the acute and chronic aquatic criteria values and the existing quality (unused assimilative capacity) may be allocated. For purposes of human health protection, "significant degradation" means that no more than 10% of the difference between the human health criteria and the existing quality (unused assimilative capacity) may be allocated. The significant degradation baseline (antidegradation baseline) is calculated for each pollutant as follows:

Antidegradation baseline (aquatic life) = 0.25 (WQS – existing quality) + existing quality

Antidegradation baseline (human health) = 0.10 (WQS – existing quality) + existing quality

Where:
"WQS" = Numeric criterion listed in 9 VAC 25-260-5 et seq. for the parameter analyzed
"Existing quality" = Concentration of the parameter being analyzed in the receiving stream, including the facility's existing discharge.

The antidegradation baselines become the new water quality criteria in order to prevent "significant degradation" of the receiving stream. Effluent limits for future expansions or new facilities must be written to maintain the antidegradation baselines for each pollutant. Antidegradation baselines have been calculated for this facility as described above, in accordance with Guidance Memo 00-2011. The baselines are in the Water Quality Criteria/Waste Load Allocation Analysis spreadsheets found in APPENDIX F. Because this facility is an expanded facility all permit limits are evaluated using the antidegradation waste load allocations. Permit limits are in compliance with antidegradation requirements set forth in the 9 VAC 25-260-30.

15. **SITE VISIT:** March 31, 2010 by Bob Tate
A copy of the site visit report is included in APPENDIX B.

16. **EFFLUENT SCREENING & LIMITATIONS DEVELOPMENT:** In accordance with the previous VPDES permit limitations and monitoring requirements, effluent was monitored during the previous permit period for flow, pH, BOD_5, TSS, DO, and *E. coli*. DMR data from October 2005 thorough May 2010 are summarized in APPENDIX D.

Effluent data for the Water Quality Criteria/Waste Load Allocation Analysis spreadsheets came from application monitoring data (hardness) and from daily operations logs from Jan 1, 2009 through Dec 1, 2009 (temperature and pH). These data and calculations are in APPENDIX D.

100% mix was used in accordance with the previous permit, which was based on the discharge diffuser and a previous CORMIX model (APPENDIX E). Previous permit actions included correspondence approving the CORMIX model and are attached. The CORMIX model was updated for permit reissuance in 2005 to include 6.0 and 8.0 MGD tiers and to ensure a complete, instantaneous mix was appropriate based on design criteria of the diffuser as installed.

Water Quality Criteria/Waste Load Allocation Analyses spreadsheet printouts are in APPENDIX F. STATS program results are in APPENDIX G. Specific parameters and their limitations are discussed below, and are to be monitored and reported according to the permit.

Effluent limitations and monitoring requirements for the WWTF are determined by applying Virginia's WQS, Federal Effluent Guidelines 40 CFR 133, and the previous permit. DEQ Guidance Memo 00-2011 was used in developing water quality based limits. Final effluent limitations, monitoring frequencies, and their basis are noted on the attached TABLE I.

TABLE I

FINAL EFFLUENT LIMITATIONS FOR TOWN OF CHRISTIANSBURG WWTF

PARAMETER	BASIS FOR LIMITS	EFFLUENT LIMITATIONS				MONITORING REQUIREMENTS	
		Monthly Average	Max. Weekly Average	Minimum	Maximum	Frequency	Sample Type
Flow, (MGD)	NA	NL	NA	NA	NL	Continuous	Totaling, Indicating, Recording
pH (SU)	1, 2	NA	NA	6.0	9.0	1/day	Grab
BOD_5 (6 MGD)	1, 4	30 mg/l 681 kg/d	45 mg/l 1022 kg/d	NA	NA	1/day	24 HC
BOD_5 (8 MGD)	1, 4	30 mg/l 908 kg/d	45 mg/l 1363 kg/d	NA	NA	1/day	24 HC
TSS (6 MGD)	1	30 mg/l 681 kg/d	45 mg/l 1022 kg/d	NA	NA	1/day	24 HC
TSS (8 MGD)	1	30 mg/l 908 kg/d	45 mg/l 1363 kg/d	NA	NA	1/day	24 HC
DO	4	NA	NA	6.0	NA	1/day	Grab
E. coli	2	126 n/100mL	NA	NA	NA	1/day 10 am – 4 pm	Grab

Notes:
NA = Not Applicable
NL = No Limitations
The basis for the limitation codes are:

1. Technology-based Limits (Federal Effluent Guidelines 40 CFR 133)
2. Water Quality-based Limits (Virginia Water Quality Standards 9 VAC 25-260-00 *et seq*)
3. Best Professional Judgment-based Limits
4. Other – WQMP, Stream Model

Flow: A facility upgrade from 3.0 MGD to 4.0 MGD was completed in 2001; an upgrade to 6.0 MGD was completed in 2010; upgrade to 8.0 MGD is anticipated by the end of this permit term. This permit does not provide a flow limitation, but requires flow to be continuously indicated, recorded, and totalized.

pH: Limitations are 6.0 S.U. minimum and 9.0 S.U. maximum. These limits are carried forward from the previous permit and are based on Virginia's WQS 9 VAC 25-260-50 and Federal Effluent Guidelines' Secondary Treatment Standards 40 CFR 133. Daily monitoring is continued, per the Permit Manual.

BOD_5: Concentration limits are 30 mg/L monthly average and 45 mg/L maximum weekly average. These limits are carried forward from the previous permit and are based on the Federal Effluent Guidelines' Secondary Treatment Standards 40 CFR 133. Loading limits, also carried forward from the previous permit, are:

6.0 MGD – 681 kg/day monthly average and 1022 maximum weekly average;
8.0 MGD – 908 kg/day monthly average and 1363 maximum weekly average.

All limits are protective of the dissolved oxygen (DO) water quality standards in the New River according to updated DO models for 6 MGD and 8 MGD design flows (see APPENDIX I). The models also demonstrate that BOD limits are protective of the DO antidegradation standard (0.2 mg/l max drop). Daily monitoring is continued, per the Permit Manual.

TSS: Concentration limits are 30 mg/L monthly average and 45 mg/L maximum weekly average. These limits are carried forward from the previous permit and are based on the Federal Effluent Guidelines' Secondary Treatment Standards 40 CFR 133. Loading limits, also carried forward from the previous permit, are:

6.0 MGD – 681 kg/day monthly average and 1022 maximum weekly average;
8.0 MGD – 908 kg/day monthly average and 1363 maximum weekly average.

Daily monitoring is continued, per the Permit Manual.

Dissolved Oxygen: A 6.0 mg/L DO minimum limit is carried forward from the previous permit, and complies with WQS 9 VAC 25-260-50. Updated DO models for 6 MGD and 8 MGD design flows (APPENDIX I) confirm that this DO limit protects DO WQS criteria for Class IV waters: 4.0 mg/L (minimum) and 5.0 mg/L (daily average). The DO models also demonstrate that DO limits are protective of the DO antidegradation standard (0.2 mg/l max drop). Daily monitoring is continued, per the Permit Manual.

E. coli: The *E. coli* limitation is a monthly geometric mean of 126 N/100 mL. This limit is carried forward from the previous permit and is based on WQS 9 VAC 25-260-170. The *E. coli* limit replaced the fecal coliform limitation in the 2000-2005 permit and monitors effectiveness of the ultraviolet light (UV) disinfection system. Daily monitoring between 10 am and 4 pm is continued, per the Permit Manual.

Ammonia: There are no ammonia limitations in this permit. Reasonable potential water quality analyses, in accordance with GM 00-2011, determined no limits are needed to maintain Virginia's WQS for both 6.0 MGD and 8.0 MGD flow tiers. STATS printouts for annual and wet season analyses are in APPENDIX G.

Other Water Quality Parameters: WQS criteria monitoring data from EPA Form 2A were reviewed to determine if effluent limitations were necessary. WQS parameters detected above respective quantification levels are ammonia (see above), copper, zinc, nitrate, and total dissolved solids (TDS). All other parameters were below the quantification levels or not at a level sufficient to require analysis. The detected parameters were evaluated for reasonable potential to exceed the antidegradation water quality criteria, and no water quality based limitations are required. STATS printouts for copper and zinc are in APPENDIX G. Nitrate and TDS data were compared to human health (PWS) waste load allocations for both 6.0 and 8.0 MGD design flows. A chart with nitrate and TDS application monitoring data is in APPENDIX D. Waste load allocations are in the spreadsheets in APPENDIX F.

The application for permit reissuance submitted in 2005 included WQS criteria monitoring data as required by the 2000-2005 permit. The data were reviewed to determine if effluent limitations were necessary. Suitable parameters detected above the quantification levels included zinc, cyanide, and phenols. All other parameters were below the quantification levels or not at a level sufficient to require analysis. In 2005 the detected parameters were analyzed for reasonable potential to exceed the antidegradation water quality criteria, and no water quality based limitations were required.

PCBs: PCB monitoring for Outfall 001 is included in a permit special condition (Part I.B.10). Justification is provided by 9VAC 25-260-10, 9 VAC 25-260-140, and GM09-2001. 9VAC 25-260-10 and 9 VAC 25-260-140 are part of Virginia's Water Quality Standards. 9VAC 25-260-10 contains the "fishable" designated use. 9 VAC 25-260-140 contains the PCB water quality criterion. GM09-2001 provides the PCB monitoring protocol for TMDL development. A PCB TMDL for the New River is scheduled for development by 2014. PCB monitoring of storm water outfalls is addressed in VPDES Industrial Storm Water General Permit registration. GM09-2001 stipulates that the PCB data should not be used for compliance purposes.

Whole Effluent Toxicity (WET) Program:
Monitoring is carried forward from the previous permit, which contained conditions for WET testing after expansion to 6.0 MGD design capacity. Initial quarterly chronic toxicity testing is required. The chronic tests are:

3-brood static renewal survival and reproduction tests using *Ceriodaphnia dubia* (water fleas);
7-day static renewal survival and growth tests using *Pimephales promelas* (fathead minnows).

The same tests will be required at 8.0 MGD design capacity.

For both 6.0 MGD and 8.0 MGD design capacities, the compliance endpoint determined by WETLIM10 is chronic NOEC of 6% equivalent to a TUc of 16.67. Test NOECs are to be reported as TUc. LC50 at 48 hours and IC25 are to be reported. Sampling is to be 24-hour flow-proportioned composites.

The previous permit required annual acute testing of *Ceriodaphnia dubia* and *Pimephales promelas* at 4.0 MGD design flow. Acute testing results were excellent and are included in APPENDIX H. APPENDIX H also contains a WET summary memo and WETLIM 10 spreadsheets.

Reduced Monitoring: All permit applications received after May 4, 1998, are to be considered for reduction in effluent monitoring frequency. GM 98-2005 states that "only facilities having exemplary operations that consistently meet permit requirements should be considered for reduced monitoring." The WWTF has demonstrated excellent performance. However, a warning letter (WL) and several notices of violation (NOV) have been issued due to overflows in the sewerage collection system:

NOV W2009-7-0004 dated Jul 15, 2009 re: 12 overflows in May, 2009
WL W2009-10-W-1002 dated Oct 8, 2009 re: 2 overflows in Aug, 2009
NOV W2009-12-0002 dated Dec 7, 2009 re: 4 overflows in Jun, Aug, and Oct, 2009
NOV W2010-01-0003 dated Jan 6, 2010 re: 6 overflows in Nov, 2009
NOV W2010-02-0004 dated Feb 10, 2010 re: 11 overflows in Dec, 2009
NOV W2010-03-0005 dated Mar 10, 2010 re: 7 overflows in Jan, 2010
NOV W2010-05-0004 dated May 6, 2010 re: 2 overflows in Mar, 2010
NOV W2010-06-0005 dated Jun 10, 2010 re: 1 overflow in Apr, 2010
NOV W2010-07-0004 dated Jul 8, 2010 re: 2 overflows in May, 2010

Effluent monitoring has not been reduced in this permit issuance because:

1. the compliance history cited above;
2. reduced monitoring would be based on 4.0 MGD performance and the facility will be operating at 8.0 MGD design capacity.

17. **BASES FOR BIOSOLIDS LIMITATIONS AND MONITORING REQUIREMENTS:**

Sewage sludge treatment consists of anaerobic digestion and thickening (gravity belt thickener). Ultimate disposal is by land application of liquid biosolids. Sewage sludge and land application site permit limitations and monitoring are required based on the VPDES Permit Regulation (9 VAC 25-31-420 through 720), the VPA Permit Regulation (9 VAC 25-31-310 through 760), Standards for the Use or Disposal of Sewage Sludge, and 40 CFR Part 503. Christiansburg WWTF is responsible for sludge use disposal (by land application) in accordance with their Sludge Management Plan (SMP), which is approved with this permit reissuance.

Monitoring Type: Biosolids Monitoring
Monitoring Location: final biosolids product after all treatment, prior to land application

PARAMETER	BASES FOR LIMITS	LIMITATIONS		MONITORING REQUIREMENTS	
		Monthly Average	Maximum	Frequency	Sample Type
Percent Solids (%)	1	NL	NA	*	Composite
Volatile Solids (%)	1	NL	NA	*	Composite
Total Arsenic (mg/kg)	2	41	75	*	Composite
Total Cadmium (mg/kg)	2	39	85	*	Composite
Total Copper (mg/kg)	2	1,500	4,300	*	Composite
Total Lead (mg/kg)	2	300	840	*	Composite
Total Mercury (mg/kg)	2	17	57	*	Composite
Total Molybdenum (mg/kg)	2	NA	75	*	Composite
Total Nickel (mg/kg)	2	420	420	*	Composite
Total Selenium (mg/kg)	2	100	100	*	Composite
Total Zinc (mg/kg)	2	2,800	7,500	*	Composite
TKN (mg/kg)	1	NL	NA	*	Composite
Ammonium Nitrogen (mg/kg)	1	NL	NA	*	Composite
Nitrate Nitrogen (mg/kg)	1	NL	NA	*	Composite
Total P (mg/kg)	1	NL	NA	*	Composite
Total K (mg/kg)	1	NL	NA	*	Composite
pH (SU)	1	NL	NA	*	Composite
Alkalinity, CCE as $CaCO_3$ (%)	1	NL	NA	*	Composite

NL = No Limitation, monitoring required NA = Not Applicable

* Frequency of sampling biosolids from each generator is based on the amount of biosolids produced by that generator that is land applied.

Amount of biosolids[(1)] (dry tons per 365-day period)	Frequency
Greater than zero but less than 320	Once per year
Equal to or greater than 320 but less than 1,653	Once per quarter (four times per year)
Equal to or greater than 1,653 but less than 16,535	Once per 60 days (six times per year)
Equal to or greater than 16,535	Per month (12 times per year)
Note:[(1)] Either the amount of bulk biosolids applied to the land or the amount of sewage sludge received by a person who prepares biosolids that is sold or given away in a bag or other container for application to the land (dry weight basis).	

Bases for Effluent Limitations
1. 9 VAC 25-31-490, 560, 570; 9 VAC 25-32-440, 450, 480 Tables 2 & 3
2. 9 VAC 25-31-490, 540 Tables 1 & 3, 560, 570; 9 VAC 25-32-440, 450, 480 Tables 2 & 3, 660 Tables 7 A & B

Monitoring Type: Biosolids Monitoring (only applicable to biosolids that are subject to Cumulative Pollutant Loading Rates (CPLRs))
Monitoring Location: land application fields where biosolids subject to CPLRs are land applied

PARAMETER	BASES FOR LIMITS	LIMITATIONS		MONITORING REQUIREMENTS	
		CPLR*		Frequency	Sample Type
		(kg/ha)	(lb/A)		
Total Arsenic	1	41	36	Each Application	Calculated
Total Cadmium	1	39	35	Each Application	Calculated
Total Copper	1	1,500	1,340	Each Application	Calculated
Total Lead	1	300	270	Each Application	Calculated
Total Mercury	1	17	16	Each Application	Calculated
Total Molybdenum	NA	NA	NA	Each Application	Calculated
Total Nickel	1	420	375	Each Application	Calculated
Total Selenium	1	100	89	Each Application	Calculated
Total Zinc	1	2,800	2,500	Each Application	Calculated

NA = Not Applicable

Bases for Effluent Limitations: 1. 9 VAC 25-31-540 Table 2; 9 VAC 25-32-660 Table 8

Monitoring Type: Soils Monitoring
Monitoring Location: all land application sites before sludge is reapplied

PARAMETER	BASES FOR LIMITS	LIMITATIONS	MONITORING REQUIREMENTS	
			Frequency	Sample Type*
Soil pH (SU)	1	NL*	***	Composite
Cation Exchange Capacity (meq/100 g)	1	NL	****	Composite
Available Phosphorus (mg/kg)	1	NL**	****	Composite
Exchangeable Potassium (mg/kg)	1	NL	****	Composite
Exchangeable Magnesium (mg/kg)	1	NL	****	Composite

NL = No Limitation, monitoring required

* = 9 VAC 25-32-560.B.3.a Lime amended biosolids shall be applied at rates that are not expected to result in a target soil pH in the plow layer above a pH of 6.5 for soils located in the coastal plain and above a pH of 6.8 in other areas of the state.

** = 9 VAC 25-32-660 If soils exhibit very high soil test phosphorus of 55 or more parts per million phosphorus (Mehlich I analytical test procedure or equivalent procedure approved by the Department of Conservation and Recreation), the maximum application rates for phosphorus contained in biosolids together with phosphorus contained in other applied nutrient sources to the site and all applicable phosphorus management practices shall be consistent with the nutrient management plan (prepared by a certified nutrient management planner as stipulated in regulations promulgated pursuant to §10.1-104.2 of the Code of Virginia).

*** = 9 VAC 25-32-560.B.2 Prior to biosolids application - For biosolids with a cadmium concentration greater than or equal to 21 mg/kg the soil pH sample must be less than 1 year old.

**** = Prior to biosolids application - Soil samples shall be collected and analyzed no more than 3 years prior to the application

Bases for Effluent Limitations: 1. 9 VAC 25-32-460, 480 Table 5

18. **ANTIBACKSLIDING STATEMENT:** No permit limits for the existing discharge will be made less stringent with this permit reissuance. Therefore, the permit complies with the antibacksliding requirements.

19. **COMPLIANCE SCHEDULES:** There are no compliance schedules in this permit.

20. **SPECIAL CONDITIONS:**

Part I.B.1 95% Capacity Reopener
Rationale: Required by VPDES Permit Regulation, 9 VAC 25-31-200 B 4 for all POTW and PVOTW permits.

Part I.B.2 Indirect Dischargers
Rationale: Required by VPDES Permit Regulation, 9 VAC 25-31-200 B.1 & B.2 for POTWs and PVOTWs that receive waste from someone other than the owner of the treatment works.

Part I.B.3 CTC, CTO Requirement
Rationale: Required by Code of Virginia § 62.1-44.19; Sewage Collection and Treatment Regulations, 9 VAC 25-790.

Part I.B.4 O&M Manual Requirement
Rationale: Required by Code of Virginia § 62.1-44.19; Sewage Collection and Treatment Regulations, 9 VAC 25-790; VPDES Permit Regulation, 9 VAC 25-31-190 E.

Part I.B.5 Licensed Operator Requirement
Rationale: The VPDES Permit Regulation, 9 VAC 25-31-200 C and the Code of Virginia § 54.1-2300 *et seq*, Rules and Regulations for Waterworks and Wastewater Works Operators (18 VAC 160-20-10 *et seq*.), require licensure of operators.

Part I.B.6 Reliability Class
Rationale: Required by Sewage Collection and Treatment Regulations, 9 VAC 25-790 for all municipal facilities.

Part I.B.7 Sludge Use and Disposal
Rationale: VPDES Permit Regulation, 9 VAC 25-31-100 P; 220 B2, and 420 through 720, and 40 CFR Part 503 require all treatment works treating domestic sewage to submit information on sludge use and disposal practices and to meet specified standards for sludge use and disposal.

Part I.B.8 Sludge Reopener
Rationale: Required by VPDES Permit Regulation, 9 VAC 25-31-220 C for all permits issued to treatment works treating domestic sewage.

Part I.B.9 Compliance Reporting Under Part I.A
Rationale: Authorized by VPDES Permit Regulation, 9 VAC 25-31-190 J 4 and 220 I. This condition is necessary when toxic pollutants are monitored by the permittee and a maximum level of quantification and/or a specific analytical method is required in order to assess compliance with a permit limit or to compare effluent quality with a numeric criterion. The condition also establishes protocols for calculation of reported values.

Part I.B.10 PCB Monitoring for Total Maximum Daily Load (TMDL) Development
Rationale: This special condition requires the permittee to monitor and report PCB concentrations in dry weather and wet weather effluent samples consistent with 9 VAC 25-260-280. The results from this monitoring shall be used to develop a PCB TMDL for the New River.

Part I.B.11 Total Maximum Daily Load (TMDL) Reopener
Rationale: Section 303(d) of the Clean Water Act requires that total maximum daily loads (TMDLs) be developed for streams listed as impaired. This special condition is to allow the permit to be reopened if necessary to bring it into compliance with any applicable TMDL approved for the receiving stream. The re-opener recognizes that, according to Section 402(o)(1) of the Clean Water Act, limits and/or conditions may be either more or less stringent than those contained in this permit. Specifically, they can be relaxed if they are the result of a TMDL, basin plan, or other wasteload allocation prepared under Section 303 of the Act.

Part I.C Pretreatment
Rationale: VPDES Permit Regulation, 9 VAC 25-31-730 through 900, and 40 CFR Part 403 require certain existing and new sources of pollution to meet specified regulations.

Part I.D Whole Effluent Toxicity Program
Rationale: VPDES Permit Regulation, 9 VAC 25-31-210 and 220 I, requires monitoring in the permit to provide for and assure compliance with all applicable requirements of the State Water Control Law and the Clean Water Act.

Part I.E Biosolids Reporting Requirements

Monitoring
Rationale: Fee Regulation 9 VAC 25-20-147.B requires submittal of a report by the 15th of the month following the month in which land application occurred. Specific information to be provided and maintenance requirements are identified in 9 VAC 25-20-147.A.

Monthly Activity Report
Rationale: 9 VAC 25-32-440.B and Fee Regulation 9 VAC 25-20-147.B require submittal of a report by the 15th of the month following the month in which land application occurred. Specific information to be provided and maintenance requirements are identified in 9 VAC 25-20-147.A.

Land Application Fee
Rationale: State Water Control Law § 62.1-44.19.3.P requires that a fee be charged to the generator of biosolids to be land applied in Virginia. The fee of $7.50/dry ton of biosolids applied in the Commonwealth of Virginia is established by the Fee Regulation 9 VAC 25-20-146 and 9 VAC 25-20-40.A.3. Exemptions to the fee are provided in 9 VAC 25-20-50.C. 9 VAC 20-60.D establishes the due date.

Annual Report
Rationale: 9 VAC 25-31-590 and 9 VAC 25-32-440.D requires the submittal of certain permit requirements for the previous calendar year's activities on February 19 of each year.

Records Retention
Rationale: 9 VAC 25-31-580 and 9 VAC 25-32-80 H.2 indicate that biosolids documents shall be maintained for at least 5 years.

Part I.F Biosolids Land Application Special Conditions

Application Sites
Rationale: 9 VAC 25-31-100.P requires the submission of site information for the permit application. 9 VAC 25-32-340 states that no land application of biosolids shall occur except in compliance with a permit issued by the board authorizing the activity. Section 340 refers to the submission of specific forms in Article 4 (9VAC25-32-670 et seq.) required for permit application. The Sludge Management Plan (SMP) shall include a list of all sites presented in the application and approved with the issuance of the permit, with basic contact and location information provided in the permit application.

Nutrient Management Plan (NMP) Requirement
Rationale: State Water Control Law § 62.1-44.19.3.C.8 requires that a nutrient management plan (NMP) be developed by a person certified in accordance with § 10.1-104.2 for each biosolids land application site, prior to application of biosolids at the site. The statute also establishes conditions where the NMP must be approved by the Department of Conservation and Recreation prior to submittal at the time of permit application. 9 VAC 25-31-505.A requires site specific nutrient management plans for all application sites prior to sewage sludge land application. VPA Regulation 9VAC25-32-680.A.2, with which all biosolids operations must comply, requires that the NMP be submitted to the farmer/operator of the site, the Department of Conservation and Recreation, and the local government, unless requested in writing to not receive the NMP. 9VAC25-32-680.A.3 requires that all nutrient management plans account for all sources of nutrients to be applied to the site.

Loading Rates
Rationale: 9 VAC 25-31-505.A - Site specific nutrient management plans and the cumulative trace element loading rates (9 VAC-25-32-540 Table 2). 9 VAC 25-31-220.I.4.a states that mass or other measurements for each pollutant of concern may be specified in the VPDES Permit. 9 VAC 25-31-220.I.4.c allows for other measurements as appropriate. 9 VAC 25-32-560.B.3.a. Site specific application rates should be proposed using pertinent biosolids plant available nitrogen (PAN) and crop nutrient needs (agronomic rate listed in Table 10) and the cumulative trace element loading rates (Table 8). 9 VAC 25-32-100.3.c.(1) states that mass or other measurements for each pollutant of concern may be specified in the VPA Permit. 9 VAC 25-32-100.3.c.(3) allows for other measurements as appropriate.

14 Day Notification Prior to Land Application
Rationale: State Water Control Law § 62.1-44.19.3.L, 9 VAC 25-31-485.D, and 9 VAC 25-32-510.H require notification to the Department 14 days prior to land application at a specific site.

Signage Requirements
Rationale: 9 VAC 25-32-530.B requires a sign be posted at a land application site at least 48 hours prior to delivery of biosolids at the site and remain on site until 48 hours after application is complete. 9 VAC 25-32-530.C-D specifies construction, content and maintenance of the sign.

100 Day Notification to the Locality
Rationale: 9 VAC 25-31-485.C and 9 VAC 25-32-510.F require notification to the locality 100 days prior to the initial land application at a specific site. § 62.1-44.19.3.K specifies that this rule does not apply to applications commenced prior to October 10, 2005.

Addition of Sources
Rationale: Water Control Law and the VPA Permit Regulation do not require a permit modification to add a new source; therefore a source may be added with administrative authorization based on review of the appropriate permit application forms for that source.

Certified Land Applicator Requirement
Rationale: State Water Control Law § 62.1-44.19.3.1.B. declares that Class B biosolids shall not be land applied unless a certified land applicator is onsite at all times during the application.

Sludge Management Plan (SMP) Requirement
Rationale: VPDES Permit Regulation 9 VAC 25-31-100 P, 220 B 2, and 420 through 720, and 40 CFR Part 503 require all treatment works treating domestic sewage to submit information on their sludge use and disposal practices and to meet specified standards for sludge use and disposal. Technical requirements are derived from the VPA Permit regulation 9 VAC 25-32-10 *et seq.* 9 VAC 25-32-310 et seq. refers to "operation and maintenance manual, sludge management plan or management practices plan". 9 VAC 25-32-500 requires submission of a sludge management plan or management practices plan.

Threatened or Endangered Species
Rationale: 9 VAC 25-31-550.A and 9 VAC 25-32-530 require that land application of biosolids in accordance with the regulations is not to result in harm to threatened or endangered species, nor result in the destruction or adverse modification of the critical habitat of a threatened or endangered species.

Infrequent Application
Rationale: 9 VAC 25-32-560.B.3.a.(1) specifies requirements for infrequent application.

Frequent Application Below Agronomic Rate
Rationale: 9 VAC 25-32-560.B.3.a.(5) specifies requirements for frequent, below agronomic rate application.

Liquid Application Rate Limitation
Rationale: 9 VAC 25-32-560.B.3.c.(1) specifies requirements for application of liquid biosolids.

Operational Limitations During Periods of Inclement Weather
Rationale: 9 VAC 25-31-505.A and 9 VAC 25-32-560.B.3.c (2) specify requirements for application during inclement weather.

Injection or Incorporation Requirement
Rationale: 9 VAC 25-32-560.B.3.b requires direct injection or incorporation within 48 hours of application on sites with less than 60% uniform residue cover or at times when the site is subject to frequent flooding as defined by soil survey information.

Slope Restrictions
Rationale: 9 VAC 25-32-560.B.3.b-c specifies maximum slope restrictions and management practices to follow when applying on field with slopes between 5% and 15%. 9 VAC 25-31-460.C indicates that site-specific conditions can justify requirements concerning slope and other factors.

Buffer Zones
Rationale: 9 VAC 25-32-560.B.3.d (1) establishes setback distances. 9 VAC 25-32-560.B.3.d.(2) allows extension of buffer zones to 400 feet or more from occupied dwellings under certain conditions. 9 VAC 25-32-100-6 allows for site-specific conditions. 9 VAC 25-32-490 allows standards and requirements more stringent than in the VPA regulation. 9 VAC 25-31-505.D indicates that site-specific conditions can justify extended setback distances.

Transport Vehicles
Rationale: 9 VAC 25-32-540.A requires that vehicles transporting biosolids be sealed and watertight if carrying liquid biosolids.

Cadmium and Soil pH
Rationale: 9 VAC 25-32-560.B.2 requires that the biosolids/soil mixture have a final pH of 6.0 S.U. or greater if the soil cadmium concentration is greater than 21 mg/kg.

Landowner Consent and Notice
Rationale: 9 VAC 25-32-60.A.1.d requires the submission of landowner consent forms. 9 VAC 25-32-80.H.2 requires the consent forms to be maintained for a minimum of 5 years or for the duration of the permit. 9 VAC 25-32-530.A requires the permittee to maintain the agreement.
Site Restrictions for Land Application of Class B Biosolids
Rationale: 9 VAC 25-31-710.B.5 and 9 VAC 25-32-620.B require restricted access for sites based on type of food crops, grazing livestock and human access.

Restrictions for CPLR Biosolids Application
Rationale: 9 VAC 25-31-530.B and 9 VAC 25-32-640 establish maximum cumulative pollutant loading of trace elements on soils.

Restrictions for CPLR Biosolids Application to Sites Previously Used
Rationale: 9 VAC 25-31-530.E.2 establishes restrictions for application for previously used sites. 40 CFR Part 503.12(e)(2)(i –iv), which applies to all biosolids applied in the USA, establishes July 20, 1993 as the date to begin accounting for pollutant loading to soils.

CPLR Biosolids Tracking
Rationale: 9 VAC 25-31-100.P.8.d(2) requires biosolids from all sources and classifications to be accounted.
Recordkeeping for PC and CPLR Biosolids
Rationale: 9 VAC 25-31-580.A.1 and 4.b and 9 VAC 25-32-80.H.2. require that specified biosolids documentation be maintained for at least 5 years.

Recordkeeping for CPLR Biosolids
Rationale: 9 VAC 25-31-580.A.5.b and 9-VAC-32-80.H.2 require that specified biosolids documentation be maintained for at least 5 years.

Reporting Land Application of Biosolids Upon Attaining 90% of CPLR
Rationale: EPA 40 CFR Part 503.18(2), which applies to all biosolids applied in the USA, requires this reporting. 9 VAC 25-31-590.A.2 states that information concerning 90% of more of any cumulative pollutant loading rates in Table 2 of 9 VAC 25-31-540 is reached at a land application site is to be submitted on February 19 of each year for the calendar previous year's activity.

Depth to Water Table Restrictions
Rationale: Required for biosolids based on 9 VAC 25-320-560.B.2.

Depth to Bedrock Restrictions
Rationale: Required for biosolids based on 9 VAC 25-320-560.B.2.

Part I.G Biosolids Storage Special Conditions

Storage Regulatory Basis
Rationale: 9 VAC 25-31-505.E requires compliance with State Water Control Law § 62.1-44.19:3 R.

Emergency Storage
Rationale: 9 VAC 25-32-550.B and C define emergency storage and establish general requirements.

Temporary Storage
Rationale: 9 VAC 25-32-550.B and D.1-7 define temporary storage and establish requirements.

Part I.H Other Biosolids Requirements or Special Conditions

Reopener
Rationale: 9 VAC 25-31-220 C requires permits to contains a reopener condition for when changes are made in promulgated standards or regulations on which permits were based. 9 VAC 25-32-220 allows a permit to be opened when a change is made in the promulgated standards or regulations on which the VPA permit was based.

Prohibition of Point Source Discharges and Storm Water Exception
Rationale: 9 VAC 25-32-30.A states that all pollutant management activities, including biosolids land application, shall maintain no point source discharge of pollutants to surface waters except in the case of a storm event greater than the 25-year, 24-hour storm.

Materials Handling/Storage
Rationale: State Water Control Law § 62.1-44.5 and 9 VAC 25-32-30.B prohibit a discharge of any substance to state waters that may alter the properties of such state waters.

Part II Conditions Applicable to All Permits
Rationale: VPDES Permit Regulation, 9 VAC 25-31-190 requires all VPDES permits to contain or specifically cite the conditions listed.

21. **PERMIT CHANGES:** TABLE II contains changes to effluent limits or monitoring frequencies in this permit.

TABLE II
PERMIT PROCESSING CHANGE SHEET
For Effluent Limits and Monitoring Schedule

Outfall No.	Parameters Changed	Monitoring Requirements Changed		Effluent Limits Changed		Reason for Change
		From	To	From	To	
001	BOD & TSS (4.0 MGD)	1/day	NA	454.2 kg/day 681.3 kg/day	NA	expansion to 6.0 MGD
001	BOD & TSS (6.0 MGD)	NA	NA	681.3 kg/day 1021.9 kg/day	681 kg/day 1022 kg/day	GM 06-2016
001	BOD & TSS (8.0 MGD)	NA	NA	908.4 kg/day 1362.6 kg/day	908 kg/day 1363 kg/day	GM 06-2016
001	PCBs	NA	4/2years	NA	NA	GM 09-2001: PCB Monitoring for TMDL Development

Special Conditions Added to or Modified in this Permit
Some special conditions have not been modified except for their number or to reflect current guidance. Only the special conditions listed below have been modified in content or added to this permit:

Special Conditions removed:

- Previous Part I.B.7, Water Quality Criteria Reopener, has been removed because all monitored water quality criteria parameters are limited.
- Previous Part I.B.12, Bypass Point Sources, has been removed per Permit Manual Section MN-3 D.

Special Conditions modified or added:

- The previous permit's CTC, CTO special condition has been slightly modified to agree with current Permit Manual Section MN-3 A.5.
- The previous permit's O&M Manual special condition has been modified to agree with current Permit Manual Section MN-3 A.6.
- Compliance Reporting Special Condition has been modified to agree with current Permit Manual Section MN-3 A.15.
- PCB Monitoring Special Condition has been added to Part I.B per GM09-2001.
- Part I.C, Pretreatment Program conditions have been modified to agree with Permit Manual Section MN-3 A.19.
- Part I.D, Whole Effluent Toxicity (formerly Toxics Management) Program special condition has been modified for expansion to 6.0 MGD design flow and possible expansion to 8.0 MGD. The acute tests specified for 4.0 MGD design flow have been removed.
- Parts I.E-I.H, biosolids special conditions, have been greatly modified to reflect current regulations and agency guidelines. Currently the VPA Permit Regulation contains the most up-to-date biosolids regulations.

22. VARIANCES/ALTERNATE LIMITS OR CONDITIONS:
The application was submitted with two requests for application monitoring waivers, received January 20, 2010. One request was to use *E. coli* bacteria monitoring data in lieu of fecal coliform bacteria data per EPA Form 2A Part A.12. The other request was use acute toxicity testing data in lieu of both acute and chronic data per EPA Form 2A Part E. These requests were forwarded to EPA Region III on January 26, 2010 by e-mail. DEQ supported both waiver requests. No response was received by EPA, so the waivers were granted.

23. REGULATION OF USERS: 9 VAC 25-31-280 B 9 requires that every permit issued to a treatment works owned by a person other than a state or municipality provide an explanation of the Board's decision on the regulation of users. The Town of Christiansburg, a municipality, owns this treatment works, therefore this regulation does not apply. The pretreatment program required for the facility's industrial users is in Part I.C of the permit.

24. PUBLIC NOTICE INFORMATION REQUIRED BY 9 VAC 25-31-280 B

All pertinent information is on file and may be inspected and copied by contacting Bob Tate at:

Virginia Department of Environmental Quality
Blue Ridge Regional Office
3019 Peters Creek Road
Roanoke, VA 24019
Phone: 540-562-6774
email: bob.tate@deq.virginia.gov

Persons may comment in writing or by email to the DEQ on the proposed permit action, and may request a public hearing, during the comment period. Comments shall include the name, address, and telephone number of the writer and of all persons represented by the commenter/requester, and shall contain a complete, concise statement of the factual basis for comments. Only those comments received within this period will be considered. The DEQ may decide to hold a public hearing, including another comment period, if public response is significant and there are substantial, disputed issues relevant to the permit. Requests for public hearings shall state (1) the reason why a hearing is requested; (2) a brief, informal statement regarding the nature and extent of the interest of the requester or of those represented by the requester, including how and to what extent such interest would be directly and adversely affected by the permit; and (3) specific references , where possible, to terms and conditions of the permit with suggested revisions. Following the comment period, the Board will make a determination regarding the proposed permit action. This determination will become effective, unless the DEQ grants a public hearing. Due notice of any public hearing will be given. The public may review the draft permit and application at the DEQ Blue Ridge Regional Office by appointment.

25. ADDITIONAL COMMENTS

Previous Board Action: None

Staff Comments: The Christiansburg WWTF registered as VAR051370 for the VPDES Industrial Storm Water General Permit (ISWGP) in lieu of submitting Form 2F and including the industrial storm water conditions in the individual VPDES permit. The ISWGP's effective date is July 1, 2009, and expires June 30, 2014. The facility must reapply for the ISWGP before expiration to prevent a lapse in coverage for their industrial storm water outfalls. Christiansburg may alternatively submit Form 2F to request a modification to include the storm water provisions in this permit. Form 2F may be submitted with their next application for reissuance of VA0061751 and the storm water provisions can be included at that time.

The discharge is not controversial and is currently meeting the required effluent limits. The staff believes that the final effluent limitations will maintain the Water Quality Standards adopted by the Board.

Other Agency Comments: There is an active enforcement referral concerning repeated overflows in the sanitary sewer collection system. Enforcement action is likely but undetermined.

Threatened and endangered species screening information was forwarded to Virginia Department of Conservation and Recreation (DCR), the Virginia Division of Game and Inland Fisheries, (DGIF), and the United States Fish and Wildlife Service (FWS). FWS did not comment. The following recommendations were received from DCR and DGIF.
DCR recommended using UV or ozone disinfection instead of chlorine.
DGIF recommended (for biosolids land application):

a. strict adherence to erosion and sediment controls;
b. 100 meter buffer for all waterbodies, including wetlands;
c. contacting DGIF Region III Fisheries Manager prior to application at Site 8.
   Site 8 is over 2 miles downstream of Big Laurel Creek, a designated wild (brown) trout water.
   The writer left three phone messages to discuss DGIF comments. No calls were returned.

APPENDIX J contains copies of DCR and DGIF comments and DEQ's responses.

Owner Comments: On behalf of the owner, Lawrence Hoffman of Olver, Inc. requested a change to the WET testing schedule in the draft permit. The request was denied. The request letter (August 30, 2010) and BRRO's e-mail response (September 13, 2010) are in the permit development file.

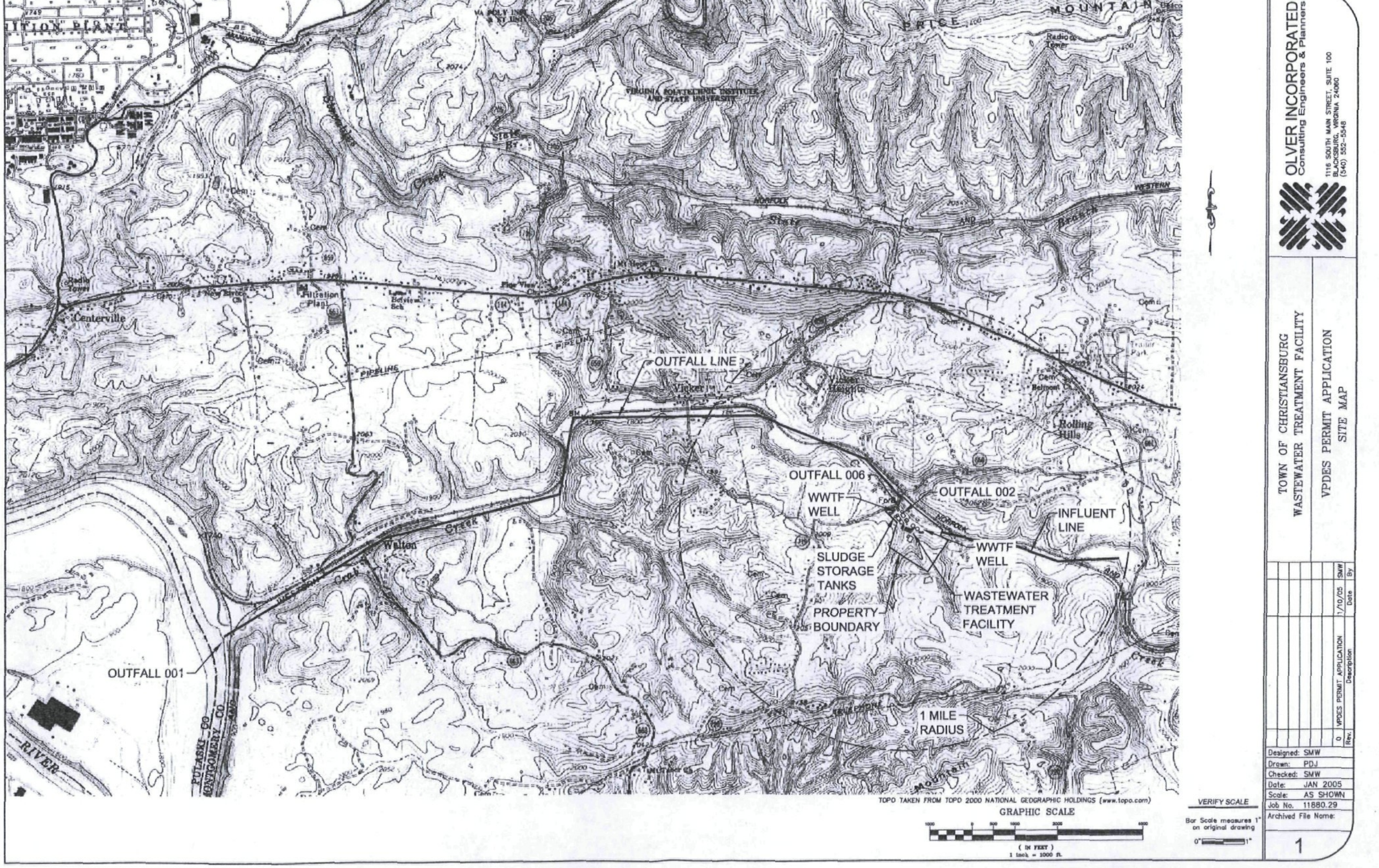
Public Notice Comments: No public comments were received during the public notice.

26. 303(d) LISTED SEGMENTS (TMDL): This facility discharges directly to the New River. The stream segment receiving the effluent is listed for non attainment of PCBs in Part I of the 2008 303(d)list. The impairment is PCBs in fish tissue. (See APPENDIX C for the impairment fact sheet.) A PCB TMDL is scheduled for development by 2014. This permit contains a PCB monitoring special condition for TMDL development. This permit also contains a TMDL reopener special condition should an approved PCB TMDL contain a wasteload allocation for the facility. No limit for PCBs is included in this permit because previous WQS monitoring indicted that PCBs were not present in the facility's discharge.

Table of Contents for Fact Sheet Appendices

APPENDIX A

LOCATION MAP



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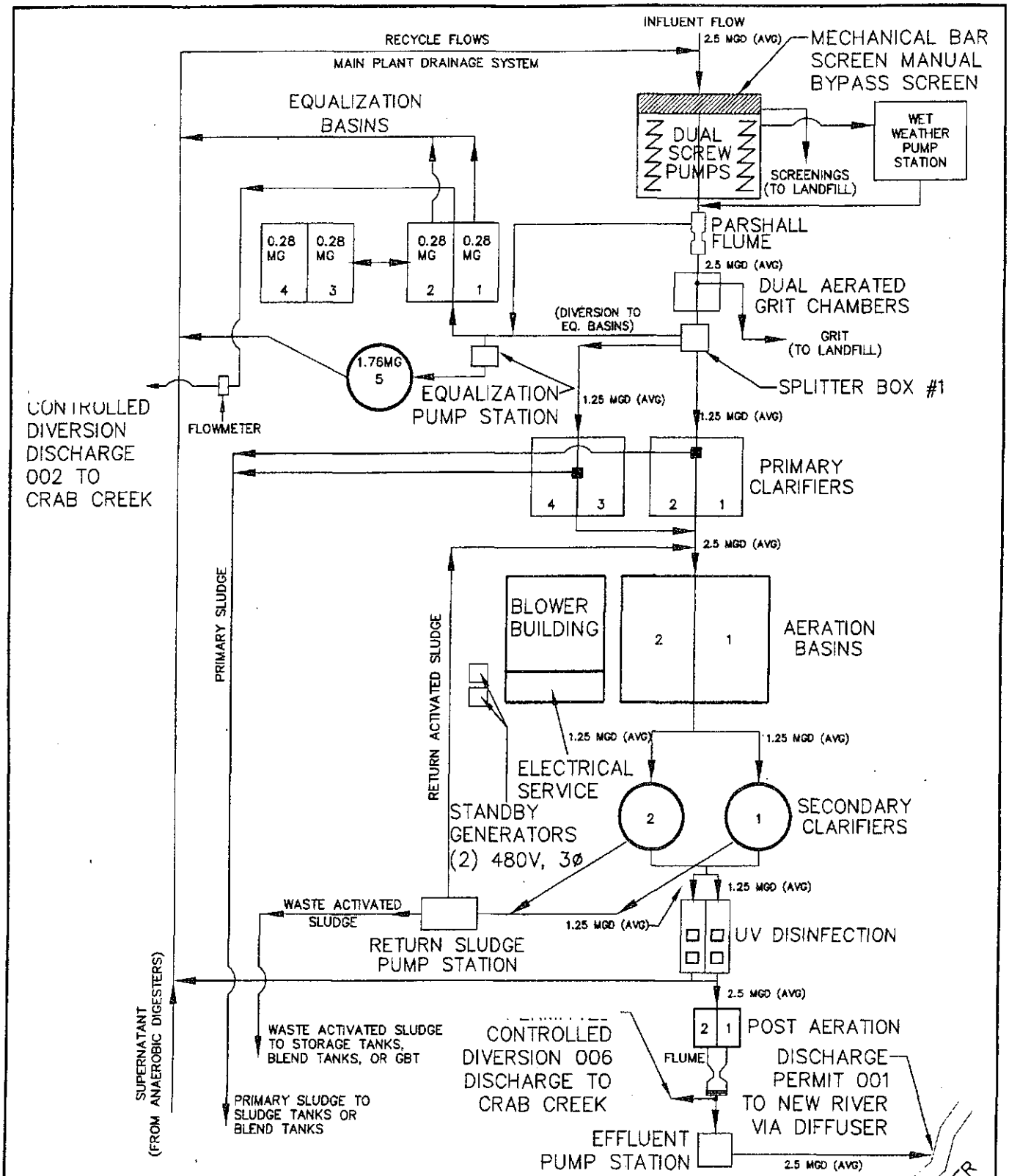
APPENDIX B

TREATMENT PROCESSES

Sewage Treatment Processes

Sludge Treatment Processes

Site Visit Report



TOWN OF CHRISTIANSBURG
WASTEWATER TREATMENT FACILITY
GENERAL FLOW SCHEMATIC/LIQUID TREATMENT

FIGURE 2

OLVER INCORPORATED

NO SCALE
JOB NO.:11880.29

JAN 18, 2010
fig1-2.DWG

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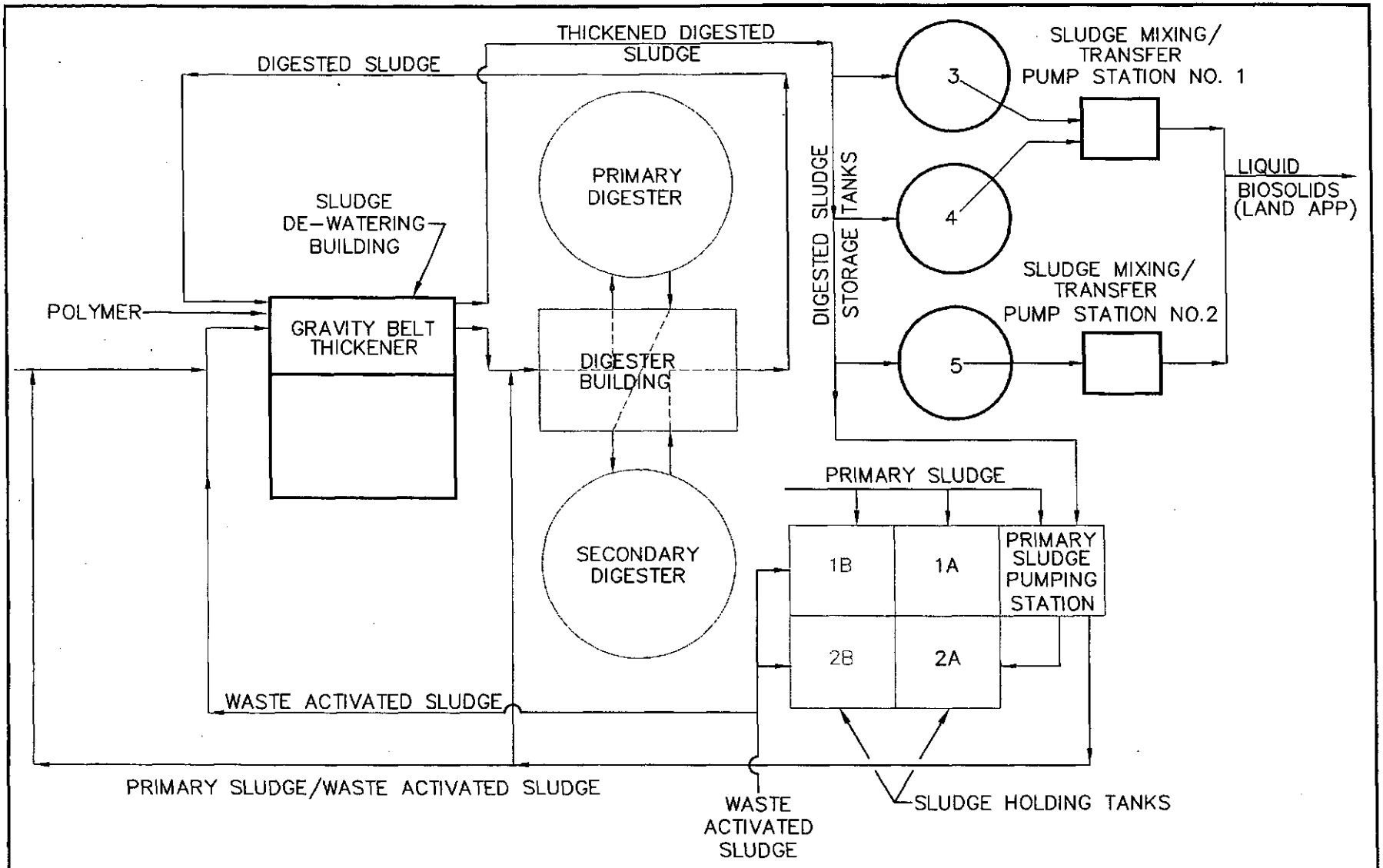


TOWN OF CHRISTIANSBURG
WASTEWATER TREATMENT FACILITY
PROCESS FLOW DIAGRAM (SOLIDS)
FIGURE 3

SCALE: NO SCALE
JOB NO.: 11880.29

OLVER INCORPORATED
JAN 11, 2005
Fig3.dwg

MEMORANDUM
VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY
BLUE RIDGE REGIONAL OFFICE
3019 Peters Creek Road
Roanoke, Virginia 24019-2738

Subject: Town of Christiansburg Wastewater Treatment Facility – VA0061751
Site Visit for VPDES Permit Reissuance

To: Permit file

From: Bob Tate, Water Permit Writer RST

Date: April 22, 2010

Introduction

A site visit to the subject facility was performed on Wednesday, March 31, 2010, in preparation for reissuance of the VPDES permit. The Wastewater Treatment Facility (WWTF) is located in Montgomery County west of Christiansburg at 2557 Crab Creek Road (State Route 660).

Meeting

The visit started with a meeting to present and discuss permitting issues. Present were: Denny Fisher, WWTF superintendent; David Peyton, Chief Operator, Helen Pack, Lab Supervisor, Dottie Wheeler, Pretreatment/Biosolids; Jackie Peyton, Operator; Barry Helms, Assistant Town Manager; Lawrence Hoffman, Olver Director of Environmental Services; Amanda Marsh, Olver Environmental Scientist; Bob Tate, DEQ Water Permit Writer. The writer presented a briefing paper that summarized aspects he anticipated in the next permit. The main concerns expressed on behalf of the permittee were:

a. include a 10.0 MGD flow tier;
b. establish Outfall 006 (effluent pump station outfall) on Crab Creek as a permitted outfall;
c. PCB monitoring;
d. submission of daily operations reports with DMRs (electronic DMR submittal is anticipated).

After the meeting Denny Fisher, David Peyton, Lawrence Hoffman, Amanda Marsh, and Bob Tate went to observe the discharge location and where Crab Creek flows into the New River. The writer took pictures. After visiting the discharge location and Crab Creek's mouth, the same group started a tour of the treatment facility. Lawrence Hoffman and Amanda Marsh had to leave before completion of the facility tour. The following is a summary of the site visit including information from the permit application and the facility's Operations and Maintenance (O&M) Manual.

Wastewater Treatment

The WWTF currently has a design capacity of 4.0 million gallons per day (MGD), with expansion to 6.0 MGD expected before permit reissuance. Expansion to 8.0 MGD and possibly 10 MGD are contingent on ongoing industrial development efforts. Descriptions of various processes follow.

Pretreatment — The headworks consists of an influent lift station, a manual bar screen, a mechanical bar screen, a Parshall flume, and two aerated grit chambers. Influent wastewater flows (by gravity) through the mechanical screen. The manual screen is available for when the mechanical screen is undergoing maintenance. Dual screw pumps, each capable of 3,850 gpm (5.5 MGD), lift wastewater

from the screening area to a Parshall flume that measures flow. If one of the screw pumps is out of service and influent flows exceed the screw pump capacity, a submersible wet weather pump station is available. This pump station has two pumps capable of pumping up to 3,500 gpm (5.0 MGD) each to meet the peak-flow pumping requirement of 15 MGD with the largest pump out of service. From the flume wastewater flows (by gravity) to two aerated grit chambers. From the grit chambers gravity flow takes wastewater to Splitter Box 1 which directs flow to equalization (EQ) basins or primary clarifiers. One 1.76 MG and four 0.28 MG EQ basins (total 2.88 MG) provide surge suppression and flow equalization. Flow to the 1.76 MG basin requires pumping. All five EQ basins are aerated.

Primary Treatment — Splitter Box 1 apportions flow to four 0.112 MG primary rectangular clarifiers that remove floating and settleable solids. Each clarifier is designed for 1.0 MGD (total 4.0 MGD). Flow enters each clarifier at one end and exits via a weir at the opposite end, maintaining even flow distribution and preventing short circuiting. After passing over the weirs, wastewater collects in troughs and recombines in a single pipe for gravity flow to aeration basins. Lime feed (to supply alkalinity) is available immediately downstream of primary treatment. Primary sludge handling is discussed in another section.

Secondary Treatment — Splitter Box 2 apportions primary treatment effluent to two 0.7 MG rectangular aeration basins. Each basin is designed for 3.0 MGD treatment (total 6.0 MGD). Each basin is divided into five zones. Wastewater is mixed with biological floc (activated sludge) and aerated. Air is supplied by fine bubble diffusers. Normal mode of operation is plug flow, however step feed of aeration basin influent is available. Treated wastewater flows by gravity from aeration basins to two secondary clarifiers. The clarifiers separate activated sludge biomass by gravity settling. Clear liquid supernatant is discharged to the ultraviolet (UV) disinfection system. Sludge from secondary clarifiers gravity flows to a sludge wet well, where it can either be pumped to aeration basins as return activated sludge (RAS) or pumped to waste (waste activated sludge = WAS). WAS handling is described in another section.

Disinfection — Secondary clarifier effluent flows by gravity to the ultraviolet (UV) disinfection system. The UV system consists of two channels, each channel is equipped with two banks of UV tubes. Each channel is capable of disinfecting a peak flow of 9.0 MGD flow (total 18.0 MGD). Weirs at the end of the channels control flow. From the UV system, effluent gravity flows to the former chlorine contact tanks for aeration.

Post Aeration — After disinfection, treated wastewater flows by gravity to two former chlorine contact tanks. Aeration is by fine bubble diffusion. The current permit contains a dissolved oxygen limit of 6.0 mg/L (minimum), monitored daily.

Effluent Flow Measurement — After aeration, fully treated wastewater flows by gravity to a Parshall flume that provides the effluent flow measurement for the plant. Flow was 3.63 MGD at 12:15 the day of the site visit.

Discharge — Fully treated effluent is pumped from the WWTF to Outfall 001 through approximately 20,000 feet of 24-inch pipe. The effluent pump station contains a wet well and three pumps, each pump capable of 3700 gpm (5.3 MGD) at 40 feet TDH. Total pumping capacity is 10.6 MGD with one pump out of service. At Outfall 001, an in-stream diffuser discharges fully treated wastewater to

the New River. The outfall is located about 500 feet upstream of where Crab Creek joins the New River. The approximate diffuser location was observed the day of the site visit. Neither foam nor floating solids were observed..

(The following information is from the 2005 CORMIX modeling document. The diffuser is positioned on the river bottom closer to the east bank. River depth is approximately 4½ feet at 1Q10 flow condition. Effective diffuser length is 90 feet. Diffuser ports extend from 83 to 173 feet relative to the east bank. The river is approximately 700 feet wide at the diffuser location. Currently the diffuser is configured for 4.0, 6.0, and 8.0 MGD discharges. CORMIX II modeling in 2005 appeared to predict complete mixing within 18 feet downstream for 4.0, 6.0 and 8.0 MGD discharges. Plugs can be removed to increase diffuser capacity.

Outfall 002 on Crab Creek can discharge overflow from five equalization basins with total storage of 2.88 MG. Excessive flows are currently diverted to the equalization basins after passing through the grit chambers. Effluent from 002 would receive only screening and grit removal. No discharges have occurred at this outfall since the 4.0 MGD expansion in 2000. Outfall 002 discharges can be metered.

Outfall 006 on Crab Creek can discharge from the effluent pump station. Effluent from 006 would receive full treatment. No discharges have occurred at this outfall since the 4.0 MGD expansion in 2000. Outfall 006 discharges can be metered.

Outfalls 002 and 006 are recognized in the current permit as bypass points. Discharges from these outfalls must be reported according to Part II.U of the permit. From the 2010 VPDES Permit Manual: "There is no need to list in the permit the potential points where bypasses may occur or to include any further special language addressing bypasses at the facility. Bypasses must be reported in accordance with Part II.U."

Compliance Monitoring

The compliance monitoring point is at the influent channel to the effluent pump station, immediately downstream of aeration and effluent flow measurement.

Sludge Handling

There are three phases to sludge handling and treatment: thickening, anaerobic digestion, and disposal. Primary sludge and secondary waste activated sludge (WAS) are pumped to one of four sludge holding tanks. From the sludge holding tanks, sludge can be pumped to a gravity belt thickener (GBT), usually operated one day a week. (Alternatively, WAS can be pumped directly to the GBT). One or two cationic polymer solutions (Polydine C-6262 and C-9545) are added to enhance thickening. GBT filtrate is recycled to the head of the plant.

Thickened sludge is pumped to the primary digesters, enclosed tanks with floating airtight covers, for stabilization by anaerobic bacteria. (Alternatively, sludge from the sludge holding/blending tanks can be pumped directly to the primary digester, bypassing the GBT). Sludge in each primary digester is mixed by two external, mechanical mixers. The mixers are reversible and recirculate the digesters by pulling sludge from the bottom (or top) and discharging it to the top (or bottom). Temperature

maintenance is critical; optimum temperature is 95 ^{O}F. Methane produced in both digesters is used to maintain optimum sludge temperatures (heater/heat exchanger) in both units. Sludge removed from the secondary digester is typically pumped to the GBT to increase the solids content to four to six percent.

Following digestion, stabilized sludge (with approximately five to six percent solids content) is pumped to on-site storage. Five storage tanks (three circular, two rectangular) provide 0.654 MG of treated sludge storage. Treated sludge (biosolids) is loaded into tanker trucks for transport to six farm land application sites in Montgomery County. The Town is responsible for the entire sludge disposal program, although the town has hired ELMS, Inc. to spread the liquid sludge on farm fields. Biosolids are applied infrequently (once every three years) to each land application site, not exceeding the nitrogen agronomic rate. According to the current permit, biosolids treatment must:

a. meet the maximum monthly average pollutant concentration (PC) requirements in Table 3 of 9 VAC 25-31-540,
b. achieve Class B pathogen reduction by anaerobic digestion, and
c. achieve vector attraction reduction through a minimum 38% reduction in volatile solids.

Material/Chemical Storage

Storage at the WWTF includes diesel fuel (up to 5,000 gallons), unleaded gasoline (up to 300 gallons), polymers, HTH, caustic, lime, and small quantities of cleaning chemicals and paint. Waste oil is no longer stored at the facility but is collected in 5 gallon drums and taken to be recycled off site.

Emergency Power:

Two on-site diesel generators, capable of 450 kW and 300 kW, can provide emergency power.

Storm Water

There are four storm water outfalls at the facility. The facility is registered (as VAR051370) for the VPDES Industrial Storm Water General Permit rather than include storm water provisions in VPDES VA0061751. DEQ recently finished registration statement processing. Total suspended solids (TSS) must now be monitored and reported semiannually because the Crab Creek Benthic TMDL contains a TSS wasteload allocation (2.479 tons/year) for the facility.

APPENDIX C

RECEIVING STREAM INFORMATION

Impairment Fact Sheet – PCB

Flow Frequency Memoranda
2010
2005

STORET Data – Station 9-NEW081.72

2008 Impaired Waters

Categories 4 and 5 by DCR Watershed*

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

New River Basin

Fact Sheet for DCR Watershed: N18.*

Cause Group Code: **N29R-01-PCB** **New River, Claytor Lake, Peak Creek and Reed Creek**

Location: The impairment begins at the I-77 bridge crossing the New River and extends downstream to the VA/WVA State Line and includes the tributaries Peak Creek and Reed Creek as described below.

City / County: Giles Co. Montgomery Co. Pulaski Co. Radford City

Use(s): Fish Consumption

Cause(s)* /
VA Category: PCB in Fish Tissue/ 5A

The Virginia Department of Health (VDH) issued a fish consumption advisory on August 6, 2001 for polychlorinated biphenyls (PCBs) for the lower portion of the New River (Rt. 114 Bridge downstream to the VA / WVA State Line - 52.0 miles) based on fish tissue collections from Carp. An Advisory extension to Claytor dam was issued 8/06/2003 (11.47 miles) recommends that no carp be consumed in these waters and no more than two meals per month of flathead and channel catfish. The VDH PCB Fish Consumption Advisory was further extended upstream on the New River (13 miles) to the I-77 Bridge to include the lower portions of Peak Creek (4.95 miles), Reed Creek (16.35 miles) and Claytor Lake (4,287 acres) on 12/02/2004. The VDH advises consumption should not exceed two meals per month for carp and smallmouth bass. The VDH level of concern is 50 parts per billion (ppb) in fish tissue.

There are eight fish tissue collection sites within the 2008 data window reporting exceedences of the WQS based 54 ppb fish tissue value (TV). These data are reviewed by the VDH in making an advisory determination. A complete listing of collection sites and associated fish tissue data are available at http://www.deq.virginia.gov/fishtissue/fishtissue.html. A more detailed presentation of the data can also be found using an interactive mapping application at http://gisweb.deq.state.va.us/. The VDH Advisory information is also available via the web at http://www.vdh.virginia.gov/Epidemiology/PublicHealthToxicology/Advisories/.

New River, Claytor Lake, Peak Creek and Reed Creek ***DCR Watershed: N18 - Fish Consumption**	Estuary* (Sq. Miles)	Reservoir* (Acres)	River* (Miles)
PCB in Fish Tissue - Total Impaired Size by Water Type:			**9.74**

Sources:

Source Unknown

*Header Information: Location, City/County, Cause/VA Category and Narratives; describe the entire extent of the Impairment. Sizes presented are for Assessment Units (AUs) lying within the DCR Watershed boundary noted above.

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY - WATER DIVISION
Blue Ridge Regional Office
3019 Peters Creek Road Roanoke, Virginia 24019

SUBJECT: Flow Frequencies Determination
Town of Christiansburg Wastewater Treatment Plant – VA0061751

FROM: Bob Tate, water permit writer RBT

DATE: March 8, 2010

This memo is an update of the previous flow frequency determination memo from Jason Winningham dated January 27, 2005, which updated the memo from Paul Herman dated August 12, 1996. The purpose is to determine flow frequencies for developing effluent limitations in reissuance of VPDES Permit VA0061751. The Town of Christiansburg WWTP discharges to the New River downstream of Radford, VA. Discharge is through a multiport diffuser in the New River, approximately 500 feet upstream the mouth of Crab Creek. Crab Creek flow into the New River is complicated because flow is divided between the New River and a parallel channel that combines with the river approximately 2000 feet downstream of the creek's mouth. For mixing purposes, a conservative approach was chosen for flow frequency analyses. The approach assumes that no Crab Creek flow is available for mixing. Thus this revised flow frequency memo considers only New River flows.

The flow frequencies for the New River were determined using the continuous record gage on the New River at Radford, VA (#03171000), which has been operated by the USGS since 1939.

New River at Radford, VA (#03171000):
Drainage Area = 2,748 mi^2

1Q30	= 678 CFS		
1Q10	= 719 CFS	High Flow 1Q10	= 840 CFS
7Q10	= 887 CFS	High Flow 7Q10	= 1,210 CFS
30Q10	= 1,020 CFS	High Flow 30Q10	= 1,660 CFS
30Q5	= 1,140 CFS	Harmonic Mean	= 2,350 CFS

New River flows at the discharge location were determined using drainage area proportions and do not address any discharges or springs located between the gage and the outfall. There are no withdrawals identified in the State Water Use Data System database that are located between the gage and the discharge point.

New River at discharge:
Drainage Area = 2,765 mi^2

1Q30	= 682 CFS = 441 MGD		
1Q10	= 723 CFS = 467 MGD	High Flow 1Q10	= 845 CFS = 546 MGD
7Q10	= 892 CFS = 577 MGD	High Flow 7Q10	= 1,217 CFS = 786 MGD
30Q10	= 1,026 CFS = 663 MGD	High Flow 30Q10	= 1,670 CFS = 1,079 MGD
30Q5	= 1,147 CFS = 741 MGD	Harmonic Mean	= 2,365 CFS = 1,527 MGD

Notes: The high flow months are January through May.
Stream measurements are through 2003.
Flow statistics were compiled in 2005.

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY - WATER DIVISION
West Central Regional Office
3019 Peters Creek Road Roanoke, Virginia 24019

SUBJECT: Flow Frequency Determination
Town of Christiansburg STP – VA0061751

FROM: Jason Winningham, WCRO

DATE: January 27, 2005

This memo is an update of the previous flow frequency determination memo from Paul Herman dated August 12, 1996, concerning the subject VPDES permit.

The Town of Christiansburg STP discharges to the New River near Radford, VA. The discharge point is just upstream of the mouth of Crab Creek. Stream flow frequencies are required at this site and for Crab Creek at its mouth for the purpose of developing effluent limitations for the VPDES permit.

The DEQ conducted several flow measurements on Crab Creek from 1995 to 2003. The measurements were taken just above the STP near Christiansburg, VA (#03171170). The measurements made by the DEQ correlated very well with the same day daily mean values from the continuous record gage on the S. F. Roanoke River near Shawsville, VA (#02053800). The measurements and the daily mean values were plotted on a logarithmic graph and a best fit line was drawn through the data points. The flow frequency data from the reference gage was entered into the regression line's slope-intercept equation to determine the associated flow frequencies at the measurement site. The attached spreadsheets and graph are attached.

The flow frequencies at the mouth of Crab Creek were determined by using the values at the measurement site and adjusting them by proportional drainage areas. The data for the reference gage, the measurement site, and the discharge point are presented below:

S. F. Roanoke River near Shawsville, VA (#02053800):

Drainage Area = 110 mi^2

1Q10	= 13 CFS	High Flow 1Q10 =	24 CFS
7Q10	= 14 CFS	High Flow 7Q10 =	28 CFS
30Q5	= 21 CFS	HM =	55 CFS
30Q10	= 18 CFS	High Flow 30Q10 =	40 CFS

Crab Creek at the STP near Christiansburg, VA (#03171170):

Drainage Area = 13.79 mi^2

1Q10	= 3.2 CFS	High Flow 1Q10 =	4.6 CFS
7Q10	= 3.4 CFS	High Flow 7Q10 =	5.1 CFS
30Q5	= 4.3 CFS	HM =	7.5 CFS
30Q10	= 3.9 CFS	High Flow 30Q10 =	6.2 CFS

Crab Creek at its mouth:

Drainage Area = 19.72 mi^2

1Q10 = 4.6 CFS	High Flow 1Q10 = 6.6 CFS
7Q10 = 4.8 CFS	High Flow 7Q10 = 7.2 CFS
30Q5 = 6.1 CFS	HM = 10.7 CFS
30Q10 = 5.6 CFS	High Flow 30Q10 = 8.9 CFS

The flow frequencies for the New River at the discharge point were determined using the continuos record gage on the New River at Radford, VA (#03171000), which has been operated by the USGS since 1939. Flows at this site were determined using drainage area proportions and do not address any discharges or springs located between the gage and the outfall. There are no withdrawals identified in the State Water Use Data System database that are located between the gage and the discharge point. The flow frequencies for the gage and the discharge point are listed below.

New River at Radford, VA (#03171000):

Drainage Area = 2,748 mi^2

1Q10 = 720 CFS	High Flow 1Q10 = 851 CFS
7Q10 = 912 CFS	High Flow 7Q10 = 1,243 CFS
30Q5 = 1,168 CFS	HM = 2,368 CFS
30Q10 = 1,063 CFS	High Flow 30Q10 = 1,722 CFS

New River above Crab Creek:

Drainage Area = 2,765 mi^2

1Q10 = 724 CFS	High Flow 1Q10 = 856 CFS
7Q10 = 918 CFS	High Flow 7Q10 = 1,251 CFS
30Q5 = 1,175 CFS	HM = 2,383 CFS
30Q10 = 1,070 CFS	High Flow 30Q10 = 1,733 CFS

New River below Crab Creek:

Drainage Area = 2,765 mi^2

1Q10 = 729 CFS	High Flow 1Q10 = 863 CFS
7Q10 = 922 CFS	High Flow 7Q10 = 1,258 CFS
30Q5 = 1,181 CFS	HM = 2,393 CFS
30Q10 = 1,075 CFS	High Flow 30Q10 = 1,742 CFS
1Q10 = 471 MGD	High Flow 1Q10 = 557 MGD
7Q10 = 596 MGD	High Flow 7Q10 = 813 MGD
30Q5 = 763 MGD	HM = 1,546 MGD
30Q10 = 695 MGD	High Flow 30Q10 = 1,125 MGD

The high flow months are January through May.

S. F. Roanoke River near Shawsville, Va. (Reference gage #02053800)
vs Crab Creek at STP, near Christiansburg, Va. (measurement site #03171170)

	Historic Flow Data (cfs)		Reference sites not used		
Date	S.F. Roanoke R.	Crab Creek	Little River	Walker Creek	Wolf Creek
8/7/1995	34	5.63	163	54	47
10/28/1996	84	9.11	243	90	107
6/30/1997	53	7.34	261	91	97
9/22/1997	23	4.15	106	31	24
8/3/1998	36	6.13	137	56	60
10/5/1998	22	4.97	130	44	38
6/8/1999	24	5.54	121	77	61
9/2/1999	16	3.96	52	32	12
6/27/2000	27	3.77	128	48	41
4/24/2002	45	4.07	160	213	219
6/20/2002	16	4.1	80	64	58
8/7/2002	8.8	2.8	41	45	47
10/9/2002	14	3.34	70	38	29
11/7/2002	56	7.2	231	402	678
3/26/2003	165	14	467	449	317
6/4/2003	150	18.8	433	270	305
	(Reference)	(Meas. Site)			

Flow Frequencies (cfs)		
S.F. Roanoke R.		Crab Creek
13	1Q10	3.2
14	7Q10	3.4
21	30Q5	4.3
24	HF1Q10	4.6
28	HF7Q10	5.1
55	HM	7.5
18	30Q10	3.9
40	HF30Q10	6.2
110	DA sqmi	13.79
reference (x)		measument (y)

Slope-Intercept Equation

y = 0.7266*x^0.582

DA at Crab Creek Mouth (sqmi)

19.72

Correlation data analysis

S.F. Roanoke River vs. Crab Creek

Regression Statistics	
Multiple R	0.948375402
R Square	0.899415904
Adjusted R Square	0.892231326
Standard Error	1.404133231
Observations	16

Little River vs. Crab Creek

Regression Statistics	
Multiple R	0.935208149
R Square	0.874614282
Adjusted R Square	0.865658159
Standard Error	1.567717099
Observations	16

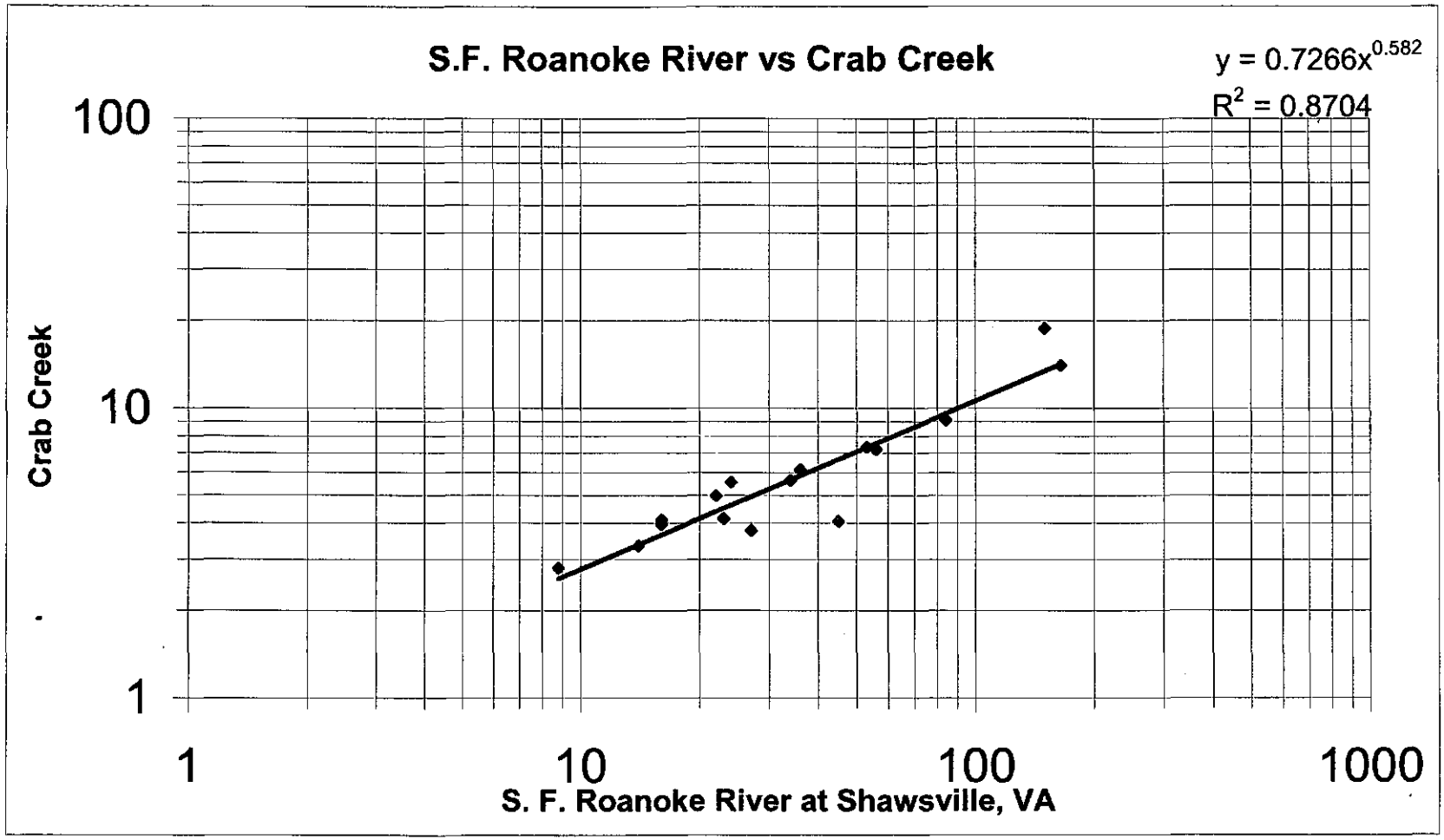
Walker Creek vs. Crab Creek

Regression Statistics	
Multiple R	0.660776797
R Square	0.436625975
Adjusted R Square	0.396384973
Standard Error	3.323089737
Observations	16

Wolf Creek vs. Crab Creek

Regression Statistics	
Multiple R	0.494320935
R Square	0.244353187
Adjusted R Square	0.190378415
Standard Error	3.848602759
Observations	16

	Meas Site cfs	Meas Site mgd	mouth cfs	New R above Crab cfs	New R below Crab cfs	New R below Crab mgd
1q10	3.2	2.1	4.6	724	729	471
7q10	3.4	2.2	4.8	918	922	596
30q5	4.3	2.8	6.1	1175	1181	763
HF 1q10	4.6	3.0	6.6	856	863	557
HF 7q10	5.1	3.3	7.2	1251	1258	813
HM	7.5	4.8	10.7	2383	2393	1546
30Q10	3.9	2.5	5.6	1070	1075	695
HF30Q10	6.2	4.0	8.9	1733	1742	1125
HF Months	Jan-May					


S.F. Roanoke River vs Crab Creek
y = 0.7266x^0.582
R^2 = 0.8704
100
10
1
Crab Creek
1
10
100
1000
S. F. Roanoke River at Shawsville, VA

WQC/WLA Spreadsheet Statistics
TOTAL HARDNESS as $CaCO_3$ in mg/L

Collection_Date_Time	Value
6/12/03 9:00	103
4/10/03 9:30	178
3/10/03 12:30	91.4
2/11/03 8:55	73.4
1/22/03 14:15	93.8
12/12/02 14:15	69.1
11/20/02 12:30	106
10/31/02 9:20	68.7
9/19/02 9:45	101
8/20/02 9:30	62.1
7/30/02 10:50	74.5
6/25/02 8:30	79.2
5/30/02 9:15	89.3
4/30/02 10:30	81.2
3/18/02 13:00	109
2/25/02 14:00	47
1/23/02 10:05	67.8
12/18/01 13:30	44.5
11/27/01 12:00	68.5
10/25/01 13:50	40.1
9/11/01 9:30	57.6
8/15/01 12:50	68.9
7/17/01 10:30	52.1
6/25/01 8:30	114
5/17/01 9:00	112
4/10/01 10:15	73.4
3/8/01 10:00	28.1
2/6/01 11:00	155
1/17/01 11:30	75.3
12/27/00 13:00	65.4
11/29/00 10:30	63.3
10/18/00 10:00	83.4
9/19/00 9:00	75.9
8/16/00 13:35	72.4
7/26/00 9:40	72.6
6/26/00 9:35	62
5/24/00 9:05	92
4/6/00 9:15	59
3/29/00 12:00	61
2/14/00 9:00	60.9
1/26/00 9:15	65.1
12/14/99 9:30	54.2
11/16/99 9:10	69.6
10/13/99 8:31	75.2
9/21/99 9:25	59.3
8/17/99 9:25	69.6
7/26/99 9:30	77
6/22/99 8:40	78
5/10/99 8:20	62
4/26/99 8:50	126
3/30/99 9:05	60
2/10/99 8:10	76
1/28/99 8:15	154
12/8/98 9:30	62
11/17/98 9:15	65
10/20/98 9:30	92
9/1/98 9:35	59.5
8/12/98 11:00	83.3
7/28/98 9:30	68.7
6/4/98 8:10	78.2
5/11/98 10:00	128
4/15/98 8:50	81
3/19/98 8:15	102
2/12/98 9:00	91
1/22/98 8:30	62.4
12/2/97 9:00	74

11/4/97 12:15	57.3
10/20/97 10:10	67.8
9/25/97 8:45	50.4
8/25/97 9:20	64.1
7/9/97 10:10	59.3
6/11/97 9:00	64.2
5/28/97 8:25	48.2
4/16/97 9:55	86.8
3/25/97 8:40	84.6
2/12/97 9:45	77.2
1/22/97 8:30	57.7
12/18/96 9:10	74
11/13/96 12:00	50
10/15/96 9:05	85
9/19/96 9:30	90
8/19/96 9:35	66
7/16/96 10:10	64
6/12/96 10:00	36
5/14/96 11:00	36
4/15/96 8:05	86
3/14/96 9:45	82
2/22/96 8:05	86
1/4/96 9:00	50
12/4/95 9:10	45
11/13/95 9:30	54
10/11/95 8:25	62
9/13/95 9:25	66
8/9/95 8:50	61
7/13/95 8:45	88
6/21/95 9:35	96
5/24/95 8:20	73
4/20/95 8:25	88
3/29/95 10:35	84
2/27/95 9:55	65
1/24/95 9:30	45
12/21/94 10:30	40
12/7/94 10:05	46
11/3/94 9:50	46
10/11/94 10:00	57
9/28/94 10:30	62
8/4/94 9:35	70
7/7/94 10:00	70
6/7/94 10:00	97
5/3/94 9:15	93
4/7/94 9:20	101
3/28/94 9:10	176
2/3/94 9:15	118
1/26/94 10:10	82
12/2/93 13:15	72
11/1/93 9:20	74
10/12/93 9:20	90
9/1/93 9:35	72
8/2/93 9:45	76
7/7/93 9:15	78
mean hardness	**76**

Station_ID 9-NEW081.72
Station_Description Rt. 11 Bridge at Radford
Latitude 37-8-19
Longitude 80-34-30
Stream_Name New River
Watershed_Code VAW-N18R

WQC/WLA Spreadsheet Statistics

Temperature in ^{o}C

temp	Collection_Date_Time	temp
5.9	3/5/08 11:00	5.9
5.6	1/23/08 10:30	5.6
9.7	11/29/07 10:30	
22.2	9/27/07 10:00	
23.1	7/17/07 12:15	
14.8	5/9/07 12:25	14.8
8.8	3/20/07 9:15	8.8
7.1	1/17/07 12:15	7.1
6.2	12/14/06 9:30	
18.9	10/5/06 9:30	
23.2	8/14/06 10:45	
17.6	6/8/06 9:50	
9.2	4/6/06 9:00	9.2
5.1	2/21/06 10:00	5.1
5.4	12/19/05 10:45	
13.1	10/27/05 9:40	
24	8/10/05 10:00	
17.7	6/7/05 10:00	
12.08	4/19/05 9:10	12.08
4.63	2/17/05 9:30	4.63
11.11	12/1/04 10:30	
14.3	10/27/04 9:45	
23.3	8/25/04 12:30	
20.9	6/22/04 9:30	
13.73	4/21/04 15:55	13.73
5.14	2/18/04 10:15	5.14
8.2	12/22/03 10:30	
14.41	10/27/03 13:00	
17.26	6/12/03 9:00	
10.56	4/10/03 9:30	10.56
8.27	3/10/03 12:30	8.27
3.1	2/11/03 8:55	3.1
4.93	1/22/03 14:15	4.93
7.02	12/12/02 14:15	
10.55	11/20/02 12:30	
13.2	10/31/02 9:20	
21.75	9/19/02 9:45	
22.9	8/20/02 9:30	
23.08	7/30/02 10:50	
19.79	6/25/02 8:30	
16.98	5/30/02 9:15	16.98
13.59	4/30/02 10:30	13.59
8.5	3/18/02 13:00	8.5
8.1	2/25/02 14:00	8.1
6	1/23/02 10:05	6
10.6	12/18/01 13:30	
17.5	10/25/01 13:50	
21.4	9/11/01 9:30	
22.1	8/15/01 12:50	

21.8	7/17/01 10:30	
17.3	6/25/01 8:30	
13.5	5/17/01 9:00	13.5
13.1	4/10/01 10:15	13.1
6.1	3/8/01 10:00	6.1
8.2	2/6/01 11:00	8.2
3.3	1/17/01 11:30	3.3
6.5	12/27/00 13:00	
8.5	11/29/00 10:30	
16.2	10/18/00 10:00	
19.1	9/19/00 9:00	
23.7	8/16/00 13:35	
20.6	7/26/00 9:40	
20.9	6/26/00 9:35	
16.3	5/24/00 9:05	16.3
10.6	4/6/00 9:15	10.6
11.4	3/29/00 12:00	11.4
4.3	2/14/00 9:00	4.3
1.9	1/26/00 9:15	1.9
9	11/16/99 9:10	
16.9	10/13/99 8:31	
19.1	9/21/99 9:25	
23	8/17/99 9:25	
22.5	7/26/99 9:30	
18.5	6/22/99 8:40	
13.8	5/10/99 8:20	13.8
12.5	4/26/99 8:50	12.5
8.1	3/30/99 9:05	8.1
6.3	2/10/99 8:10	6.3
6.4	1/28/99 8:15	6.4
12.4	12/8/98 9:30	
12.8	11/17/98 9:15	
17.1	10/20/98 9:30	
23.3	9/1/98 9:35	
23.4	8/12/98 11:00	
23.4	7/28/98 9:30	
19	6/4/98 8:10	
14.1	5/11/98 10:00	14.1
12.4	4/15/98 8:50	12.4
23.0		**13.9**
90% annual temperature		**90% wet season temperature**

wet season: January-May

Station_ID: 9-NEW081.72
Station_Description: Rt. 11 Bridge at Radford
Latitude: 37-8-19
Longitude: 80-34-30
Stream_Name: New River
Watershed_Code: VAW-N18R

WQC/WLA Spreadsheet Statistics

pH in SU

Collection_Date_Time	
3/5/08 11:00	8.1
1/23/08 10:30	8
11/29/07 10:30	8.1
9/27/07 10:00	8.2
7/17/07 12:15	7.7
5/9/07 12:25	8.3
3/20/07 9:15	8.2
1/17/07 12:15	8
12/14/06 9:30	8.2
10/5/06 9:30	7.2
8/14/06 10:45	7.6
6/8/06 9:50	7
4/6/06 9:00	6.8
2/21/06 10:00	7.8
12/19/05 10:45	7.5
10/27/05 9:40	7.8
8/10/05 10:00	7.2
6/7/05 10:00	7.8
4/19/05 9:10	8.11
2/17/05 9:30	8.06
12/1/04 10:30	7.45
10/27/04 9:45	7.1
8/25/04 12:30	7.63
6/22/04 9:30	7.47
4/21/04 15:55	7.59
2/18/04 10:15	7.75
12/22/03 10:30	7.6
10/27/03 13:00	7.72
6/12/03 9:00	7.79
4/10/03 9:30	8.12
3/10/03 12:30	7.93
2/11/03 8:55	8.23
1/22/03 14:15	8.05
12/12/02 14:15	7.64
11/20/02 12:30	7.6
10/31/02 9:20	7.13
9/19/02 9:45	7.61
8/20/02 9:30	7.23
7/30/02 10:50	7.23
6/25/02 8:30	7.28
5/30/02 9:15	7.58
4/30/02 10:30	7.72
3/18/02 13:00	8.09
2/25/02 14:00	8.24
1/23/02 10:05	8.01
12/18/01 13:30	8.48
10/25/01 13:50	8.33
9/11/01 9:30	7.72
8/15/01 12:50	7.61

7/17/01 10:30	8.1
6/25/01 8:30	7.27
5/17/01 9:00	8.09
4/10/01 10:15	7.89
3/8/01 10:00	8.49
2/6/01 11:00	8.4
1/17/01 11:30	8.21
12/27/00 13:00	8.3
11/29/00 10:30	8.01
10/18/00 10:00	7.71
9/19/00 9:00	7.49
8/16/00 13:35	7.63
7/26/00 9:40	7.55
6/26/00 9:35	7.68
5/24/00 9:05	7.9
4/6/00 9:15	7.99
3/29/00 12:00	7.94
2/14/00 9:00	7.61
1/26/00 9:15	7.52
11/16/99 9:10	7.51
10/13/99 8:31	7.84
9/21/99 9:25	7.9
8/17/99 9:25	7.71
7/26/99 9:30	7.9
6/22/99 8:40	7.92
5/10/99 8:20	8.2
4/26/99 8:50	8.18
3/30/99 9:05	8.51
2/10/99 8:10	8.16
1/28/99 8:15	7.89
12/8/98 9:30	7.38
11/17/98 9:15	7.78
10/20/98 9:30	7.98
9/1/98 9:35	7.73
8/12/98 11:00	7.79
7/28/98 9:30	7.78
6/4/98 8:10	7.84
5/11/98 10:00	8.04
4/15/98 8:50	7.71
90% maximum pH	**8.2**
10% maximum pH	**7.3**
minimum pH	**6.8**
maximum pH	**8.5**

Station_ID 9-NEW081.72
Station_Description Rt. 11 Bridge at Radford
Latitude 37-8-19
Longitude 80-34-30
Stream_Name New River
Watershed_Code VAW-N18R

APPENDIX D

EFFLUENT DATA – OUTFALL 001

Form 2A Application Monitoring Summaries

Hardness

2009 daily operation logs
Temperature
pH

DMR summaries

Form 2A monitoring for Christiansburg WWTP	max daily	units	avg daily	units	# samples	notes	
Part A.12							
pH (minimum)	6.3	SU					
pH (maximim)	7.9	SU					
Flow Rate	10.0	MGD	2.27	MGD	continuous		
Temperature (Winter)	15.0	°C	11.6	°C	276		
Temperature (Summer)	26.1	°C	21.8	°C	276		
conventional and nonconventional compounds	max daily	units	avg daily	units	# samples	analytical method	ML/MDL
BOD	34.8	mg/L	14.0	mg/L	1096	EPA 405.1	1 mg/L
COD	NA	NA	NA	NA	NA	NA	NA
fecal coliform	32	MPN/100mL	10	MPN/100mL	1096	SM 9221C	2 MPN/100mL
TSS	35.4	mg/L	13.6	mg/L	1096	EPA 160.2	1 mg/L

Form 2A monitoring for Christiansburg WWTP								from lab sheets			
Part B.6											
conventional and											
nonconventional compounds	max daily	units	avg daily	units	# samples	analytical method	ML/MDL	7/30/09	9/29/09	11/4/09	12/1/09
ammonia	0.23	mg/L	0.01	mg/L	4	SM 4500NH3,F	0.1 mg/L	0.23	<0.1	<0.1	<0.1
TRC	<0.05	mg/L	<0.05	mg/L	4	EPA 330.5	0.1 mg/L	<0.05	<0.05	<0.05	<0.05
DO	8.0	mg/L	6.4	mg/L	1096	EPA 360.1	1.0 mg/L	NA	NA	NA	NA
TKN	2.9	mg/L	1.6	mg/L	4	SM 4500N,C	1 mg/L	1.1	<0.2	2.2	2.9
nitrate+nitrite	196	mg/L	66.5	mg/L	4	SM18/4500 NO3 F	0.10 mg/L	23.4	196	21.7	25.0
O&G	<10	mg/L	<10	mg/L	3	EPA 1664A	10 mg/L	<10	<10	NA	<10
phosphorus	9.91	mg/L	5.36	mg/L	3	SM18/4500-P E	0.01 mg/L	9.91	3.03	NA	3.15
TDS	441	mg/L	396	mg/L	3	SM18/2540C	10 mg/L	441	327	NA	419

Form 2A monitoring for Christiansburg WWTP								from lab sheets		
Part D										
detections only	max daily	units	avg daily	units	# samples	analytical method	ML/MDL	7/30/09	9/29/09	12/1/09
copper	10	ug/L	8	ug/L	3	EPA 200.9/R2.2	3 ug/L	8	6	10
zinc	67	ug/L	57	ug/L	3	EPA 200.7/R4.4	10 ug/L	62	43	67
total phenolic compounds	210	ug/L	87.0	ug/L	3	EPA 420.1	50 ug/L	210	<50	<50
hardness	199	mg/L	176	mg/L	3	SM18/2340B	0.5 mg/L	185	145	199
WQS parameter detections not reported in Form 2A										
phenol - not detected								<10	<10.4	<10

Christiansburg WWTP
hardness monitoring
from application Part D

date	result
7/30/2009	185
9/29/2009	145
12/1/2009	199
mean hardness	**176**

Christiansburg WWTP
Daily Effluent Temperature
January 1, 2009 through December 31, 2009

90% annual temperature = 70oF = 21°C

90% wet season temperature = 62oF = 17°C

Day	Jan 09	Feb 09	Mar 09	Apr 09	May 09	Jun 09	Jul 09	Aug 09	Sept 09	Oct 09	Nov 09	Dec 09	Day
1	52	51	52	56	62	64	68	70	71	65	62	58	1
2	54	51	47	56	60	64	68	70	70	67	63	58	2
3	55	51	47	57	61	65	68	70	69	66	62	58	3
4	56	48	49	56	62	65	68	70	69	65	61	57	4
5	57	47	50	56	61	65	67	70	69	66	61	57	5
6	57	49	52	57	61	64	68	70	69	67	60	57	6
7	54	52	54	54	61	64	68	70	71	67	60	55	7
8	52	52	54	54	61	65	68	70	70	66	60	55	8
9	51	52	55	55	61	65	69	70	70	67	61	54	9
10	54	53	55	56	61	66	69	71	70	66	63	54	10
11	52	54	54	55	62	66	68	71	69	66	62	53	11
12	53	54	54	55	61	66	68	71	69	66	58	54	12
13	52	53	54	56	61	66	68	71	68	66	59	55	13
14	51	54	54	56	62	65	69	71	69	65	59	53	14
15	51	53	53	56	63	67	69	70	69	64	59	55	15
16	48	52	53	56	62	67	69	71	69	64	59	52	16
17	48	51	53	57	61	66	69	71	70	64	61	53	17
18	53	52	54	58	61	67	68	72	70	64	60	54	18
19	52	52	54	57	60	67	68	72	69	61	61	53	19
20	51	49	53	59	60	67	69	72	69	62	60	52	20
21	49	51	54	57	63	67	69	72	70	62	58	53	21
22	50	51	54	56	62	68	69	72	70	63	58	52	22
23	51	49	54	57	62	68	70	71	71	65	60	52	23
24	50	49	55	58	62	68	69	71	71	64	60	54	24
25	49	51	55	59	65	67	69	71	71	63	60	52	25
26	52	53	55	59	65	68	70	71	70	62	59	53	26
27	53	54	55	61	65	67	70	71	68	64	58	52	27
28	53	52	55	60	64	67	70	72	68	64	59	51	28
29	52		57	61	64	68	70	70	67	63	59	50	29
30	51		54	61	63	68	70	71	66	64	59	51	30
31	50		54		64		71	71		62		52	31

Christiansburg WWTP
Daily Effluent pH
January 1, 2009 through December 31, 2009 90% maximum pH = 7.4 SU 10% maximum pH = 6.8 SU

Day	Jan 09	Feb 09	Mar 09	Apr 09	May 09	Jun 09	Jul 09	Aug 09	Sept 09	Oct 09	Nov 09	Dec 09	Day
1	6.8	7.1	7.2	7.2	7.3	7.4	7.2	7.9	7.2	7.1	7.0	6.9	1
2	7.3	7.4	7.1	7.3	7.1	7.4	7.4	7.0	7.1	7.2	7.2	6.5	2
3	6.8	7.3	7.4	7.1	7.1	7.2	7.4	7.1	7.1	7.1	7.2	6.9	3
4	6.8	7.1	7.2	7.2	7.0	7.2	7.1	7.1	7.1	7.1	7.3	6.7	4
5	6.9	7.2	7.6	7.1	7.3	7.1	7.2	7.2	7.1	7.3	7.2	7.0	5
6	6.8	7.4	7.2	7.2	7.3	7.3	7.2	7.1	7.0	7.1	7.1	7.0	6
7	6.9	7.2	7.0	7.3	7.1	7.3	7.3	7.1	7.2	7.2	7.1	6.8	7
8	7.1	7.1	7.0	7.2	7.3	7.4	7.3	7.1	7.1	7.1	7.0	6.8	8
9	7.1	7.1	7.0	7.1	7.2	7.4	7.4	6.9	6.8	7.1	7.1	6.6	9
10	6.9	7.2	7.0	7.1	7.2	7.4	7.4	7.1	6.7	7.0	7.1	6.6	10
11	6.9	7.3	7.0	7.1	7.4	7.3	7.1	7.1	6.8	7.0	6.7	7.3	11
12	7.0	7.3	7.6	7.1	7.4	7.2	7.1	7.1	6.8	7.0	6.9	7.3	12
13	7.2	7.1	7.3	7.2	7.4	7.3	7.3	7.1	6.8	6.9	7.2	7.1	13
14	7.3	7.0	7.2	7.2	7.3	7.4	7.2	7.1	6.9	7.0	7.2	6.6	14
15	7.2	6.9	7.2	7.0	7.4	7.5	7.1	7.0	6.9	7.1	7.2	6.7	15
16	7.4	6.6	7.3	7.0	7.3	7.5	7.2	7.0	7.0	7.2	7.4	6.8	16
17	6.8	7.0	7.2	7.2	7.2	7.4	7.2	7.2	7.0	7.1	7.3	7.0	17
18	6.9	6.9	7.2	7.1	7.3	7.2	7.1	7.2	7.0	7.0	7.3	7.0	18
19	6.9	7.1	7.6	7.1	7.2	7.4	7.1	7.1	6.9	7.3	6.9	7.0	19
20	6.9	7.1	7.5	7.1	7.3	7.3	7.3	7.2	6.9	7.3	6.8	6.9	20
21	7.1	7.0	7.2	7.2	7.4	7.2	7.3	7.0	7.0	7.2	7.5	6.6	21
22	7.5	7.0	7.1	7.2	7.4	7.3	7.3	7.4	7.0	7.3	7.2	6.6	22
23	7.1	7.0	7.2	7.2	7.2	7.4	7.3	7.4	6.7	7.2	6.7	6.6	23
24	7.0	7.3	7.1	7.1	7.2	7.3	7.4	7.1	6.9	7.0	6.9	6.9	24
25	7.0	7.3	7.0	7.1	7.4	7.3	7.3	7.2	6.9	6.9	6.7	6.8	25
26	7.3	7.4	6.9	7.0	7.3	7.1	7.1	7.1	6.6	7.2	7.1	6.8	26
27	7.0	7.2	7.0	7.2	7.2	7.1	7.1	7.1	7.0	7.3	7.0	6.8	27
28	7.1	7.2	7.1	7.2	7.2	7.1	7.2	7.1	7.1	7.0	6.9	6.6	28
29	7.3		7.2	7.2	7.0	7.2	7.2	7.0	7.1	7.2	7.0	6.6	29
30	7.2		7.3	7.3	7.3	7.3	7.2	7.0	7.0	7.2	6.8	6.7	30
31	7.1		7.3		7.3		7.0	7.1		7.1		6.6	31

Outfall No	Parameter Code	Parameter Description	Due Date	Quantity Average	Quantity Maximum
001	001	FLOW	10-Jun-2010	2.299	4.374
001	001	FLOW	10-May-2010	2.386	3.828
001	001	FLOW	10-Apr-2010	3.131	4.966
001	001	FLOW	10-Mar-2010	3.104	5.421
001	001	FLOW	10-Feb-2010	3.303	7.571
001	001	FLOW	10-Jan-2010	3.694	8.364
001	001	FLOW	10-Dec-2009	2.788	10.000
001	001	FLOW	10-Nov-2009	2.182	3.302
001	001	FLOW	10-Oct-2009	2.286	5.450
001	001	FLOW	10-Sep-2009	2.170	3.237
001	001	FLOW	10-Aug-2009	2.773	3.770
001	001	FLOW	10-Jul-2009	3.563	8.472
001	001	FLOW	10-Jun-2009	3.932	9.494
001	001	FLOW	10-May-2009	2.382	3.148
001	001	FLOW	10-Apr-2009	2.576	5.041
001	001	FLOW	10-Mar-2009	1.931	2.944
001	001	FLOW	10-Feb-2009	2.298	5.993
001	001	FLOW	10-Jan-2009	2.309	6.808
001	001	FLOW	10-Dec-2008	1.971	2.793
001	001	FLOW	10-Nov-2008	1.886	2.138
001	001	FLOW	10-Oct-2008	2.116	2.884
001	001	FLOW	10-Sep-2008	2.073	6.900
001	001	FLOW	10-Aug-2008	1.963	2.785
001	001	FLOW	10-Jul-2008	1.830	2.339
001	001	FLOW	10-Jun-2008	1.979	2.972
001	001	FLOW	10-May-2008	2.236	4.579
001	001	FLOW	10-Apr-2008	1.982	3.629
001	001	FLOW	10-Mar-2008	1.981	3.616
001	001	FLOW	10-Feb-2008	1.865	2.150
001	001	FLOW	10-Jan-2008	1.927	3.151
001	001	FLOW	10-Dec-2007	1.776	1.973
001	001	FLOW	10-Nov-2007	2.317	6.152
001	001	FLOW	10-Oct-2007	1.914	2.702
001	001	FLOW	10-Sep-2007	1.764	2.054
001	001	FLOW	10-Aug-2007	2.210	3.244
001	001	FLOW	10-Jul-2007	2.006	4.026
001	001	FLOW	10-Jun-2007	2.073	4.038
001	001	FLOW	10-May-2007	2.318	6.425
001	001	FLOW	10-Apr-2007	2.468	7.482
001	001	FLOW	10-Mar-2007	2.030	2.984
001	001	FLOW	10-Feb-2007	2.251	3.749
001	001	FLOW	10-Jan-2007	1.926	3.268
001	001	FLOW	10-Dec-2006	2.244	4.809
001	001	FLOW	10-Nov-2006	2.339	4.597
001	001	FLOW	10-Oct-2006	2.168	3.581
001	001	FLOW	10-Sep-2006	2.069	3.338
001	001	FLOW	10-Aug-2006	2.241	3.147
001	001	FLOW	10-Jul-2006	2.810	11.93
001	001	FLOW	10-Jun-2006	1.869	2.591
001	001	FLOW	10-May-2006	2.021	3.793
001	001	FLOW	10-Apr-2006	1.734	2.055
001	001	FLOW	10-Mar-2006	1.862	2.304
001	001	FLOW	10-Feb-2006	2.02	3.2
001	001	FLOW	10-Jan-2006	1.985	2.636
001	001	FLOW	10-Dec-2005	1.963	4.701
001	001	FLOW	10-Nov-2005	1.987	4.866
			DESIGN	**4.0**	**4.0**

Outfall No	Parameter Code	Parameter Description	Due Date	Concentration Minimum	Concentration Maximum
001	002	PH	10-Jun-2010	6.6	7.8
001	002	PH	10-May-2010	6.7	7.1
001	002	PH	10-Apr-2010	6.6	7.2
001	002	PH	10-Mar-2010	6.4	6.9
001	002	PH	10-Feb-2010	6.4	6.9
001	002	PH	10-Jan-2010	6.5	7.3
001	002	PH	10-Dec-2009	6.7	7.5
001	002	PH	10-Nov-2009	6.9	7.3
001	002	PH	10-Oct-2009	6.7	7.2
001	002	PH	10-Sep-2009	6.9	7.9
001	002	PH	10-Aug-2009	7.0	7.4
001	002	PH	10-Jul-2009	7.1	7.5
001	002	PH	10-Jun-2009	7.0	7.4
001	002	PH	10-May-2009	7.0	7.3
001	002	PH	10-Apr-2009	6.9	7.6
001	002	PH	10-Mar-2009	6.6	7.4
001	002	PH	10-Feb-2009	6.8	7.5
001	002	PH	10-Jan-2009	6.7	7.7
001	002	PH	10-Dec-2008	6.7	7.8
001	002	PH	10-Nov-2008	7.0	7.6
001	002	PH	10-Oct-2008	6.8	7.2
001	002	PH	10-Sep-2008	6.5	7.1
001	002	PH	10-Aug-2008	6.7	7.1
001	002	PH	10-Jul-2008	6.8	7.2
001	002	PH	10-Jun-2008	6.8	7.3
001	002	PH	10-May-2008	6.7	7.3
001	002	PH	10-Apr-2008	6.5	6.9
001	002	PH	10-Mar-2008	6.7	7.6
001	002	PH	10-Feb-2008	6.9	7.4
001	002	PH	10-Jan-2008	6.3	7.2
001	002	PH	10-Dec-2007	6.4	7.4
001	002	PH	10-Nov-2007	6.5	7.4
001	002	PH	10-Oct-2007	6.6	7.4
001	002	PH	10-Sep-2007	6.7	7.4
001	002	PH	10-Aug-2007	6.4	7.3
001	002	PH	10-Jul-2007	6.8	7.3
001	002	PH	10-Jun-2007	6.7	7.2
001	002	PH	10-May-2007	6.6	7.4
001	002	PH	10-Apr-2007	6.5	7.5
001	002	PH	10-Mar-2007	6.4	7.6
001	002	PH	10-Feb-2007	6.4	6.9
001	002	PH	10-Jan-2007	6.0	6.9
001	002	PH	10-Dec-2006	6.4	7.2
001	002	PH	10-Nov-2006	6.2	7.2
001	002	PH	10-Oct-2006	6.4	7.0
001	002	PH	10-Sep-2006	6.2	7.3
001	002	PH	10-Aug-2006	6.4	7.5
001	002	PH	10-Jul-2006	6.6	7.5
001	002	PH	10-Jun-2006	6.5	6.9
001	002	PH	10-May-2006	6.1	7.7
001	002	PH	10-Apr-2006	6.0	6.7
001	002	PH	10-Mar-2006	6.2	6.8
001	002	PH	10-Feb-2006	6.0	6.8
001	002	PH	10-Jan-2006	6.1	6.8
001	002	PH	10-Dec-2005	6.1	6.9
001	002	PH	10-Nov-2005	6.6	7.2
			LIMIT	**6.0**	**9.0**

Parameter Description	Due Date	Quantity Average	Quantity Maximum	Concentration Average	Concentration Maximum
BOD5	10-Jun-2010	156.9	187.9	18.0	19.1
BOD5	10-May-2010	185.8	205.0	20.5	22.9
BOD5	10-Apr-2010	192.1	208.3	16.1	17.8
BOD5	10-Mar-2010	265.5	321.4	22.7	25.1
BOD5	10-Feb-2010	214.3	295.6	17.2	20.2
BOD5	10-Jan-2010	277.2	387.7	18.5	21.8
BOD5	10-Dec-2009	104.8	176.4	10.0	11.4
BOD5	10-Nov-2009	62.0	78.1	7.4	9.4
BOD5	10-Oct-2009	66.4	95.2	7.2	7.8
BOD5	10-Sep-2009	65.5	104.4	7.7	12.3
BOD5	10-Aug-2009	57.9	68.3	5.4	6.1
BOD5	10-Jul-2009	96.8	112.9	7.2	8.4
BOD5	10-Jun-2009	68.8	111.8	3.5	4.3
BOD5	10-May-2009	46.7	55.0	5.1	5.6
BOD5	10-Apr-2009	169.6	264.7	16.4	20.4
BOD5	10-Mar-2009	123.1	169.1	16.5	21.3
BOD5	10-Feb-2009	520.8	1866.1	34.8	96.8
BOD5	10-Jan-2009	82.7	115.6	9.1	8.5
BOD5	10-Dec-2008	90.2	115.2	11.6	15.9
BOD5	10-Nov-2008	33.4	39.3	4.7	5.5
BOD5	10-Oct-2008	45.7	59.4	5.7	7.5
BOD5	10-Sep-2008	23.4	56.0	2.5	4.3
BOD5	10-Aug-2008	43.6	50.0	5.7	6.0
BOD5	10-Jul-2008	28.4	43.2	4.0	6.2
BOD5	10-Jun-2008	126.4	165.3	15.9	21.1
BOD5	10-May-2008	146.0	158.2	17.2	19.8
BOD5	10-Apr-2008	181.0	191.6	24.2	26.7
BOD5	10-Mar-2008	185.4	223.5	25.0	30.8
BOD5	10-Feb-2008	135.4	157.7	19.2	22.4
BOD5	10-Jan-2008	87.1	111.8	11.6	15.1
BOD5	10-Dec-2007	57.4	77.6	8.5	11.5
BOD5	10-Nov-2007	51.4	72.4	5.9	6.6
BOD5	10-Oct-2007	14.9	26.5	2.1	3.7
BOD5	10-Sep-2007	35.3	49.7	5.3	7.4
BOD5	10-Aug-2007	46.7	81.5	5.4	8.1
BOD5	10-Jul-2007	25.6	49.2	3.2	6.5
BOD5	10-Jun-2007	44.0	70.6	5.4	8.9
BOD5	10-May-2007	60.6	88.9	6.3	7.6
BOD5	10-Apr-2007	95.6	209.5	8.8	13.8
BOD5	10-Mar-2007	85.5	103.4	11.2	14.4
BOD5	10-Feb-2007	141.9	168.7	16.2	17.6
BOD5	10-Jan-2007	156.8	202.3	21.5	28.4
BOD5	10-Dec-2006	144.2	191.5	17.2	25.3
BOD5	10-Nov-2006	153.1	175.0	17.4	21.4
BOD5	10-Oct-2006	95.7	132.2	11.6	17.2
BOD5	10-Sep-2006	61.1	77.1	7.5	9.0
BOD5	10-Aug-2006	53.6	57.7	6.4	7.4
BOD5	10-Jul-2006	323.3	236.4	27.5	32.2
BOD5	10-Jun-2006	185.3	241.6	25.9	32.7
BOD5	10-May-2006	387.0	566.4	48.8	77.0
BOD5	10-Apr-2006	132.8	157.0	20.1	23.2
BOD5	10-Mar-2006	174.7	229.0	24.5	31.4
BOD5	10-Feb-2006	86.6	108.9	11.4	14.2
BOD5	10-Jan-2006	91.3	119.5	12.1	14.9
BOD5	10-Dec-2005	76	77	9.2	11.4
BOD5	10-Nov-2005	45.4	74.3	5.8	7.5
	LIMIT	**454.2**	**681.3**	**30**	**45**

Parameter Description	Due Date	Quantity Average	Quantity Maximum	Concentration Average	Concentration Maximum
TSS	10-Jun-2010	89.2	104.3	10.5	13.1
TSS	10-May-2010	121.7	152.2	13.8	18.0
TSS	10-Apr-2010	111.4	117.6	9.3	10.2
TSS	10-Mar-2010	146.4	167.6	12.8	15.9
TSS	10-Feb-2010	141.0	194.4	11.6	14.8
TSS	10-Jan-2010	186.9	286.6	12.8	16.7
TSS	10-Dec-2009	96.6	152.0	9.2	11.8
TSS	10-Nov-2009	78.9	113.3	9.4	13.3
TSS	10-Oct-2009	66.4	91.0	7.4	8.2
TSS	10-Sep-2009	72.0	105.8	8.6	12.7
TSS	10-Aug-2009	76.2	78.4	7.2	7.4
TSS	10-Jul-2009	79.4	90.5	5.8	6.8
TSS	10-Jun-2009	76.6	133.9	4.5	7.0
TSS	10-May-2009	40.0	50.6	4.4	5.2
TSS	10-Apr-2009	85.7	119.8	8.4	12.4
TSS	10-Mar-2009	76.9	114.9	10.3	14.6
TSS	10-Feb-2009	545.0	2018.2	35.4	105.0
TSS	10-Jan-2009	75.1	113.8	8.3	8.8
TSS	10-Dec-2008	65.3	76.2	8.8	10.3
TSS	10-Nov-2008	43.1	44.9	6.0	6.3
TSS	10-Oct-2008	57.4	79.7	7.0	8.9
TSS	10-Sep-2008	38.4	61.2	4.7	5.2
TSS	10-Aug-2008	39.8	51.4	5.3	6.3
TSS	10-Jul-2008	45.5	62.7	6.6	9.1
TSS	10-Jun-2008	177.6	257.7	22.4	33.1
TSS	10-May-2008	156.5	189.4	18.8	25.6
TSS	10-Apr-2008	139.6	157.2	18.5	19.6
TSS	10-Mar-2008	97.0	104.3	13.5	15.3
TSS	10-Feb-2008	83.8	106.5	11.9	15.1
TSS	10-Jan-2008	57.0	63.4	7.5	7.7
TSS	10-Dec-2007	58.1	83.6	8.6	12.6
TSS	10-Nov-2007	66.4	75.4	7.7	9.6
TSS	10-Oct-2007	26.0	37.0	3.5	5.1
TSS	10-Sep-2007	46.9	53.8	7.0	8.1
TSS	10-Aug-2007	54.6	118.7	6.1	11.8
TSS	10-Jul-2007	35.1	46.3	4.6	6.1
TSS	10-Jun-2007	37.6	45.8	4.6	5.8
TSS	10-May-2007	52.9	64.2	6.0	7.2
TSS	10-Apr-2007	91.0	223.5	7.4	12.0
TSS	10-Mar-2007	84.2	105.0	11.0	14.7
TSS	10-Feb-2007	227.4	307.1	25.8	29.9
TSS	10-Jan-2007	266.6	359.2	36.0	49.5
TSS	10-Dec-2006	217.7	277.0	25.7	36.5
TSS	10-Nov-2006	241.2	327.2	27.5	39.8
TSS	10-Oct-2006	138.6	225.0	17.3	29.2
TSS	10-Sep-2006	42.3	48.6	5.3	5.7
TSS	10-Aug-2006	38.1	48.9	4.6	6.4
TSS	10-Jul-2006	235.3	143.7	14.3	22.5
TSS	10-Jun-2006	118.0	145.8	16.5	19.3
TSS	10-May-2006	711.5	1272.5	91.3	168.8
TSS	10-Apr-2006	149.5	144.3	22.8	22.5
TSS	10-Mar-2006	174.5	204.5	24.8	28.6
TSS	10-Feb-2006	81.9	135.8	10.7	17.8
TSS	10-Jan-2006	66.3	84.2	8.7	10.2
TSS	10-Dec-2005	72.6	79.1	9.4	11.9
TSS	10-Nov-2005	45.6	76.5	5.8	8.2
	LIMIT	**454.2**	**681.3**	**30**	**45**

Outfall No	Parameter Code	Parameter Description	Due Date	Concentration Minimum
001	007	DO	10-Jun-2010	6.1
001	007	DO	10-May-2010	7.6
001	007	DO	10-Apr-2010	7.0
001	007	DO	10-Mar-2010	6.2
001	007	DO	10-Feb-2010	6.6
001	007	DO	10-Jan-2010	6.4
001	007	DO	10-Dec-2009	6.4
001	007	DO	10-Nov-2009	6.6
001	007	DO	10-Oct-2009	6.3
001	007	DO	10-Sep-2009	6.3
001	007	DO	10-Aug-2009	7.1
001	007	DO	10-Jul-2009	7.9
001	007	DO	10-Jun-2009	7.0
001	007	DO	10-May-2009	8.0
001	007	DO	10-Apr-2009	5.7
001	007	DO	10-Mar-2009	6.2
001	007	DO	10-Feb-2009	6.0
001	007	DO	10-Jan-2009	7.2
001	007	DO	10-Dec-2008	7.2
001	007	DO	10-Nov-2008	7.4
001	007	DO	10-Oct-2008	7.1
001	007	DO	10-Sep-2008	6.5
001	007	DO	10-Aug-2008	6.5
001	007	DO	10-Jul-2008	7.4
001	007	DO	10-Jun-2008	7.2
001	007	DO	10-May-2008	6.6
001	007	DO	10-Apr-2008	7.6
001	007	DO	10-Mar-2008	6.6
001	007	DO	10-Feb-2008	6.3
001	007	DO	10-Jan-2008	6.2
001	007	DO	10-Dec-2007	6.4
001	007	DO	10-Nov-2007	6.6
001	007	DO	10-Oct-2007	6.8
001	007	DO	10-Sep-2007	6.6
001	007	DO	10-Aug-2007	6.9
001	007	DO	10-Jul-2007	6.4
001	007	DO	10-Jun-2007	7.5
001	007	DO	10-May-2007	6.4
001	007	DO	10-Apr-2007	6.6
001	007	DO	10-Mar-2007	6.2
001	007	DO	10-Feb-2007	6.1
001	007	DO	10-Jan-2007	6.0
001	007	DO	10-Dec-2006	6.3
001	007	DO	10-Nov-2006	6.0
001	007	DO	10-Oct-2006	6.4
001	007	DO	10-Sep-2006	6.0
001	007	DO	10-Aug-2006	6.6
001	007	DO	10-Jul-2006	6.0
001	007	DO	10-Jun-2006	6.0
001	007	DO	10-May-2006	6.2
001	007	DO	10-Apr-2006	6.2
001	007	DO	10-Mar-2006	6.2
001	007	DO	10-Feb-2006	6.1
001	007	DO	10-Jan-2006	6.5
001	007	DO	10-Dec-2005	6.3
001	007	DO	10-Nov-2005	6.2
			LIMIT	**6.0**

Outfall No	Parameter Code	Parameter Description	Due Date	Concentration Average
001	120	E.COLI	10-Jun-2010	10.6
001	120	E.COLI	10-May-2010	21.4
001	120	E.COLI	10-Apr-2010	8.7
001	120	E.COLI	10-Mar-2010	15.6
001	120	E.COLI	10-Feb-2010	18.7
001	120	E.COLI	10-Jan-2010	31.6
001	120	E.COLI	10-Dec-2009	17.5
001	120	E.COLI	10-Nov-2009	10.5
001	120	E.COLI	10-Oct-2009	11.7
001	120	E.COLI	10-Sep-2009	12.5
001	120	E.COLI	10-Aug-2009	5.6
001	120	E.COLI	10-Jul-2009	7.7
001	120	E.COLI	10-Jun-2009	6.3
001	120	E.COLI	10-May-2009	2.5
001	120	E.COLI	10-Apr-2009	6.2
001	120	E.COLI	10-Mar-2009	6.5
001	120	E.COLI	10-Feb-2009	3.9
001	120	E.COLI	10-Jan-2009	13.3
001	120	E.COLI	10-Dec-2008	10.1
001	120	E.COLI	10-Nov-2008	9.1
001	120	E.COLI	10-Oct-2008	6.4
001	120	E.COLI	10-Sep-2008	6.7
001	120	E.COLI	10-Aug-2008	5.9
001	120	E.COLI	10-Jul-2008	6.5
001	120	E.COLI	10-Jun-2008	5.3
001	120	E.COLI	10-May-2008	3.5
001	120	E.COLI	10-Apr-2008	4.1
001	120	E.COLI	10-Mar-2008	9.6
001	120	E.COLI	10-Feb-2008	26.2
001	120	E.COLI	10-Jan-2008	9.1
001	120	E.COLI	10-Dec-2007	15.7
001	120	E.COLI	10-Nov-2007	13.2
001	120	E.COLI	10-Oct-2007	15.3
001	120	E.COLI	10-Sep-2007	12.3
001	120	E.COLI	10-Aug-2007	15.9
001	120	E.COLI	10-Jul-2007	3.2
001	120	E.COLI	10-Jun-2007	2.0
001	120	E.COLI	10-May-2007	5.5
001	120	E.COLI	10-Apr-2007	5.8
001	120	E.COLI	10-Mar-2007	16.5
001	120	E.COLI	10-Feb-2007	15.6
001	120	E.COLI	10-Jan-2007	8.0
001	120	E.COLI	10-Dec-2006	9.4
001	120	E.COLI	10-Nov-2006	5.5
001	120	E.COLI	10-Oct-2006	11.9
001	120	E.COLI	10-Sep-2006	8.2
001	120	E.COLI	10-Aug-2006	6.8
001	120	E.COLI	10-Jul-2006	28.3
001	120	E.COLI	10-Jun-2006	33.1
001	120	E.COLI	10-May-2006	113.4
001	120	E.COLI	10-Apr-2006	6.5
001	120	E.COLI	10-Mar-2006	21.3
001	120	E.COLI	10-Feb-2006	3.4
001	120	E.COLI	10-Jan-2006	21.7
001	120	E.COLI	10-Dec-2005	10.6
001	120	E.COLI	10-Nov-2005	14.0
			LIMIT	**126**

APPENDIX E

STREAM MIXING ANALYSES

CORMIX (2005)

6 MGD

8 MGD

OLVER
INCORPORATED

Consulting Engineers and Planners

July 21, 2005

RECEIVED

JUL 22 2005

DEQ-WCRO

Mr. Jason Winningham
Environmental Engineer Senior
West Central Regional Office
Virginia Department of Environmental Quality
3019 Peters Creek Road
Roanoke VA 24019

Re: CORMIX Modeling Information Revision-VPDES Permit Reissuance Application,
Town of Christiansburg Wastewater Treatment Facility,
VPDES Permit No. VA0061715;
Olver Project Number: 11880.29

Dear Jason:

In response to the June 27, 2005 comments e-mailed to me, I have revisited the CORMIX modeling information that was originally submitted on June 6, 2005. The information that was submitted was an update to the CORMIX evaluation that was performed in 1996 as part of the diffuser feasibility study as part of the permitting process for the relocation of the Wastewater Treatment Plant discharge from Crab Creek to the New River. Upon review of the information available from the 1996 study, it was discovered that the diffuser design conditions modeled in 1996 were slightly different than the final diffuser design and as-built configurations. These differences were not expected to significantly influence the mixing projected using the preliminary design configurations described in the PER, nor were they expected to reduce the beneficial mixing provided by the submerged diffuser relative to the Crab Creek discharge used prior to the outfall relocation.

In order to update the 1996 CORMIX modeling information, the same model approach and input information was used, with the exception of updating the diffuser configurations; the results of the modeling using this approach were submitted on June 6, 2005. As for the 1996 evaluation, the modeling approach was to determine the distance downstream of the discharge diffuser that the effluent was diluted to below the Criterion Maximum Concentration (CMC), or the distance required for the concentration to reach ten percent of the original concentration. This distance was reported as the distance required to complete mixing. The modeled area was from the diffuser to a point 5,000 meters downstream.

The comments made by Allan Brockenbrough, II, P.E., in the VDEQ Office of Water Programs recommended that the CORMIX modeling approach be changed by examining the Regulatory Mixing Zone (RMZ-an area of the effluent plume that is characterized by an area that is less than ½ the stream's width, ⅓ the cross-sectional area of the channel, and a distance downstream equal to 5-times the stream width), rather than the distance required to reach the CMC. To that end, we modeled the dilution that will occur within the RMZ at 1Q10 and 7Q10 stream flows. The input parameters for the RMZ boundaries used in this evaluation are:

Blacksburg, Virginia
1116 South Main Street, Suite 100 (540) 552-5548
Blacksburg, Virginia 24060 (540) 552-5577 FAX

Charlotte, North Carolina
4957 Albemarle Road (704) 535-1100
Charlotte, North Carolina 28205 (704) 535-1148 FAX

1. 5X Stream Width Downstream = 1,076 meters
2. 1/3 Cross Sectional Area = Input 33.3% of average depth (1.37 m) x stream width (213.4 m)
3. ½ Stream Width = Input 50% of stream width (213.4 m)

In this evaluation, the modeled area was increased from 5,000 meters to 15,000 meters to extend the study area. It should be noted, however, that approximately 6,000 meters downstream from the diffuser discharge is a low-water dam. Any dilution modeled past the low-water dam by CORMIX may be different from the actual in-stream dilution, because CORMIX cannot take into account the effects of the dam. The input parameters for each of the modeled conditions are depicted in the table included in the attached report.

The model outputs from the RMZ evaluation are included in Attachments 1, 2, and 3 for the effluent flows of 4.0 MGD, 6.0 MGD, and 8.0 MGD, respectively. Each of the defining characteristics of the RMZ was examined separately. Table 1 summarizes the concentration of effluent (as percent) and the corresponding dilution factor at the edge of the RMZ. As depicted, the distance downstream equal to 5-times the stream width (approximately 1,076 meters downstream of the discharge) was the most limiting of the three RMZ endpoints for all of the three discharge flows except the 8.0 MGD at 1Q10 where the cross sectional area was the limiting factor. In most cases, the effluent plume did not extend to ½ of the stream width within the 15,000 meter study area; in the one situation that it did, the results should be used with caution as this distance is downstream of the low water dam.

Table 1: RMZ Evaluation Summary

	4.0 MGD			6.0 MGD			8.0 MGD		
	5X Width Down-stream	½ Stream Width	1/3 – Cross Sectional Area	5X Width Down-stream	½ Stream Width	1/3 – Cross Sectional Area	5X Width Down-stream	½ Stream Width	1/3 – Cross Sectional Area
1Q10 Flow* Concentration	**3.76%**	RMZ Not Encountered	2.57%	**4.57%**	RMZ Not Encountered	3.87%	3.96%	3.40%§	**4.00%**
1Q10 Flow* Dilution Factor	**26.6**	RMZ Not Encountered	39.0	**21.9**	RMZ Not Encountered	25.8	25.3	29.4	**25.0**
7Q10 Flow* Concentration	**3.05%**	RMZ Not Encountered	1.98%	**4.17%**	RMZ Not Encountered	2.99%	**4.52%**	RMZ Not Encountered	3.95%
7Q10 Flow* Dilution Factor	**32.8**	RMZ Not Encountered	50.1	**24.0**	RMZ Not Encountered	33.4	**22.1**	RMZ Not Encountered	25.3

Notes: Values in bold represent most limiting RMZ criteria.

*The 1Q10 Flow and 7Q10 Flow used in this evaluation were 463.5 MGD and 601.5 MGD respectively and were obtained from the Water Quality Standards Worksheet created as part of the 2002 Permit Amendment. These flows are similar to those calculated as part of the 2005 permit reissuance; as such, the most limiting RMZ criteria are expected to be the same for the new and old flow values. The difference in the new and old flows on the projected dilution factors can be determined by comparing the 7Q10 dilution factors in Table 1 and Table 3.

§The projected edge of the effluent plume extends to ½ of the stream width at 14,133 meters downstream of the discharge, which is downstream from the low-water dam. The dam would likely change the shape of the effluent plume, and cannot be modeled using CORMIX.

Allan Brockenbrough, II, P.E., also suggested that the acute mixing ratio should be determined from the most limiting of the EPA's TSD Criteria (50X discharge length scale, 5X the local water depth, or 10% of the Regulatory Mixing Zone). The distances from the discharge point to the portions of the plume to evaluate the TSD Criteria are:

1. 4.5 meters (50X discharge length scale of 0.09-meters);
2. 7.35 meters (5X the local water depth of 1.47-meters); and,
3. 108 meters (10% of the RMZ of 1,076-meters).

The 50X discharge length scale is the most limiting factor in the case of the Christiansburg diffuser. Table 2 depicts the mixing ratios determined at 4.5 meters from the diffuser using CORMIX 1 and the 1Q10 flow. CORMIX 1 models the discharge from a single diffuser port. The model outputs from the CORMIX 1 models are provided in Attachment 4.

Table 2: Mixing Ratios at 50X Discharge Length Scale at 1Q10 Flow

	4.0 MGD	6.0 MGD	8.0 MGD
1Q10 Flow* Dilution Factor	6.5	6.6	6.6

*The 1Q10 Flow of 471 MGD used in this evaluation was obtained by personal communication on June 8, 2005 with Jason Winningham.

The final comment requested that the chronic mixing ratio be determined by the dilution factor at the edge of the regulatory mixing zone. Because Olver Incorporated used the updated 7Q10 flow obtained from personal communication with Jason Winningham on June 8, 2005, the values for the chronic mixing ratio are slightly different than those obtained as part of the RMZ evaluation. The results of the model outputs from the chronic mixing ratio investigation are included in Attachment 5.

Table 3: Dilution Factors at the Edge of the RMZ with 7Q10 Flow

	4.0 MGD	6.0 MGD	8.0 MGD
7Q10 Flow* Dilution Factor	32.5	23.8	22.2

*The 7Q10 Flow used in this evaluation was 596 MGD and was obtained by personal communication on June 8, 2005 with Jason Winningham.

I believe this addresses all of the comments provided. Please do not hesitate to contact me at (540) 552-5548 or Barry Helms, Assistant Town Manager, at (540) 382-6128 should you have any questions or require any additional information.

Sincerely,

OLVER INCORPORATED

Lawrence

R. Lawrence Hoffman
Director of Environmental Services

RLH/mfs

Enclosures

Cc: Allan Brockenbrough, II, P.E., Office of Water Programs, VDEQ (w/encl.)
Lance Terpenny, Town Manager, Town of Christiansburg
Barry Helms, P.E., Assistant Town Manager, Town of Christiansburg (w/encl.)
John Olver, Ph.D., P.E., Consultant, Olver Incorporated

APPENDIX F

WATER QUALITY CRITERIA / WASTE LOAD ALLOCATION ANALYSIS SPREADSHEETS

97^{th} percentile calculations for ammonia, copper, zinc

expected upstream value calculations for ammonia, copper, zinc

6 MGD spreadsheet

8 MGD spreadsheet

5/6/2010 3:50:13 PM

Facility = Christiansburg WTF
Chemical = ammonia (annual) - 97th percentile effluent
Chronic averaging period = 30
WLAa =
WLAc =
Q.L. = 0.20
# samples/mo. = 30
# samples/wk. = 8

Summary of Statistics:

observations = 4
Expected Value = .160459
Variance = .009268
C.V. = 0.6
97th percentile daily values = .390464
97th percentile 4 day average = .266970
97th percentile 30 day average= .193522
< Q.L. = 3
Model used = BPJ Assumptions, Type 1 data

No Limit is required for this material

The data are:

0.23
0
0
0

5/6/2010 3:54:56 PM

Facility = Christiansburg WTF
Chemical = ammonia (wet season) - 97th percentile effluent
Chronic averaging period = 30
WLAa =
WLAc =
Q.L. = 0.20
# samples/mo. = 30
# samples/wk. = 8

Summary of Statistics:

observations = 4
Expected Value =
Variance =
C.V. =
97th percentile daily values =
97th percentile 4 day average = .266970
97th percentile 30 day average= .193522
< Q.L. = 3
Model used =

No Limit is required for this material

The data are:

0.23
0
0
0

5/6/2010 4:00:31 PM

Facility = Christiansburg WTF
Chemical = copper - 97th percentile effluent
Chronic averaging period = 4
WLAa =
WLAc =
Q.L. = 3
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 3
Expected Value = 8
Variance = 23.04
C.V. = 0.6
97th percentile daily values = 19.4673
97th percentile 4 day average = 13.3103
97th percentile 30 day average= 9.64842
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

8
6
10

5/6/2010 4:05:18 PM

Facility = Christiansburg WTF
Chemical = zinc - 97th percentile effluent
Chronic averaging period = 4
WLAa =
WLAc =
Q.L. = 10
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 3
Expected Value = 57.3333
Variance = 1183.36
C.V. = 0.6
97th percentile daily values = 139.515
97th percentile 4 day average = 95.3906
97th percentile 30 day average= 69.1470
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

62
43
67

5/6/2010 3:30:22 PM

Facility = Christiansburg WTF
Chemical = ammonia (annual) - expected upstream value
Chronic averaging period = 30
WLAa =
WLAc =
Q.L. = 0.04
# samples/mo. = 30
# samples/wk. = 8

Summary of Statistics:

observations = 86
Expected Value = .046155
Variance = .000355
C.V. = 0.408771
97th percentile daily values = .099738
97th percentile 4 day average = .061000
97th percentile 30 day average= .050035
< Q.L. = 66
Model used = delta lognormal

No Limit is required for this material

The data are:

0.04
0
0
0.03
0
0
0.04
0
0
0
0
0.05
0
0
0
0.05
0.05
0.05
0.06
0
0
0
0

0.04
0
0
0
0.06
0
0
0
0
0
0
0.05
0
0
0
0
0.05
0
0
0
0
0
0
0
0
0
0
0.1
0
0
0
0
0
0.04
0
0
0
0.05
0
0
0.09
0
0
0
0
0
0
0
0
0.04
0.08
0
0.15
0
0
0
0

0
0
0.06
0
0.2
0

5/6/2010 3:36:37 PM

Facility = Christiansburg WTF
Chemical = ammonia (wet season) - expected upstream value
Chronic averaging period = 30
WLAa =
WLAc =
Q.L. = 0.04
# samples/mo. = 30
# samples/wk. = 8

Summary of Statistics:

observations = 36
Expected Value = .030967
Variance = .000345
C.V. = 0.6
97th percentile daily values = .075357
97th percentile 4 day average = .051523
97th percentile 30 day average= .037348
< Q.L. = 28
Model used = BPJ Assumptions, Type 1 data

No Limit is required for this material

The data are:

0
0
0
0.05
0
0
0
0
0.04
0
0
0
0.05
0
0
0
0
0
0
0
0
0
0
0

0
0.05
0
0
0
0
0.04
0.08
0
0.06
0
0.2
0

5/6/2010 3:42:42 PM

Facility = Christiansburg WTF
Chemical = copper - expected upstream value
Chronic averaging period = 4
WLAa =
WLAc =
Q.L. = 0.5
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 2
Expected Value = .645
Variance = .149769
C.V. = 0.6
97th percentile daily values = 1.56955
97th percentile 4 day average = 1.07314
97th percentile 30 day average= .777904
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

0.67
0.62

5/6/2010 3:45:13 PM

Facility = Christiansburg WTF
Chemical = zinc - expected upstream value
Chronic averaging period = 4
WLAa =
WLAc =
Q.L. = 1
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 2
Expected Value = 3.675
Variance = 4.86202
C.V. = 0.6
97th percentile daily values = 8.94280
97th percentile 4 day average = 6.11442
97th percentile 30 day average= 4.43224
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

5.93
1.42

WATER QUALITY CRITERIA / WASTE LOAD ALLOCATION ANALYSIS

Facility Name:
Christiansburg Wastewater Treatment Facility
Receiving Stream:
New River

Permit No.: VA0061751
Date: 6/9/2010

Version: OWP Guidance Memo 00-2011 (8/24/00)

Stream Information		Stream Flows		Mixing Information			Effluent Information	
Mean Hardness (as CaCO3) =	76 mg/L	1Q10 (Annual) =	467 MGD	Annual	- 1Q10 Flow =	100 %	Mean Hardness (as CaCO3) =	176 mg/L
90% Temperature (Annual) =	23 deg C	7Q10 (Annual) =	577 MGD		- 7Q10 Flow =	100 %	90% Temp (Annual) =	21 deg C
90% Temperature (Wet season) =	14 deg C	30Q10 (Annual) =	663 MGD		- 30Q10 Flow =	100 %	90% Temp (Wet season) =	17 deg C
90% Maximum pH =	8.2 SU	1Q10 (Wet season) =	546 MGD	Wet Season	- 1Q10 Flow =	100 %	90% Maximum pH =	7.4 SU
10% Maximum pH =	7.3 SU	30Q10 (Wet season) =	1079 MGD		- 30Q10 Flow =	100 %	10% Maximum pH =	6.8 SU
Tier Designation =	2	30Q5 =	741 MGD				1992 Discharge Flow =	0.000 MGD
Public Water Supply (PWS) Y/N? =	Y	Harmonic Mean =	1527 MGD				Discharge Flow for Limit Analysis =	6.000 MGD
V(alley) or P(iedmont)? =	V							
Trout Present Y/N? =	N							
Early Life Stages Present Y/N? =	Y							

Footnotes:

1. All concentrations expressed as micrograms/liter (ug/l), unless noted otherwise.
2. All flow values are expressed as Million Gallons per Day (MGD).
3. Discharge volumes are highest monthly average or 2C maximum for Industries and design flows for Municipals.
4. Hardness expressed as mg/l CaCO3. Standards calculated using Hardness values in the range of 25-400 mg/l CaCO3.
5. "Public Water Supply" protects for fish & water consumption. "Other Surface Waters" protects for fish consumption only.
6. Carcinogen "Y" indicates carcinogenic parameter.
7. Ammonia WQSs selected from separate tables, based on pH and temperature.
8. Metals measured as Dissolved, unless specified otherwise.
9. WLA = Waste Load Allocation (based on standards).
10. WLA = Waste Load Allocation (based on standards).
11. WLAs are based on mass balances (less background, if data exist).
12. Acute - 1 hour avg. concentration not to be exceeded more than 1/3 years.
13. Chronic - 4 day avg. concentration (30 day avg. for Ammonia) not to be exceeded more than 1/3 years.
14. Mass balances employ 1Q10 for Acute, 30Q10 for Chronic Ammonia, 7Q10 for Other Chronic, 30Q5 for Non-carcinogens, and Harmonic Mean for Carcinogens. Actual flows employed are a function of the mixing analysis and may be less than the actual flows
15. Effluent Limitations are calculated elsewhere using the minimum WLA and EPA's statistical approach (Technical Support Document).

Facility Name:	Permit No.:
Christiansburg Wastewater Treatment Facility	VA0061751
Receiving Stream:	Date:
New River	6/9/2010

PRE - DISCHARGE WATER QUALITY CRITERIA

0.000 MGD Discharge Flow - 100% Stream Mix

Toxic Parameter and Form	Carcinogen?	97th Percentiles of Effluent Concentrations			Expected Value of Upstream Data	Current Downstream Mix Concentrations			Aquatic Protection		Human Health		INSTREAM BASELINES		
		Daily	4-Day	30-Day		Acute	Chronic	H-Health	Acute	Chronic	Public Water Supplies	Other Surface Waters	Acute	Chronic	H-Health
Acenaphthene	N	0	0	0	0	0	0	0	None	None	6.7E+02	9.9E+02	None	None	6.7E+01
Acrolein	N	0	0	0	0	0	0	0	None	None	6.1E+00	9.3E+00	None	None	6.1E-01
Acrylonitrile	Y	0	0	0	0	0	0	0	None	None	5.1E-01	2.5E+00	None	None	5.1E-02
Aldrin	Y	0	0	0	0	0	0	0	3.0E+00	None	4.9E-04	5.0E-04	7.5E-01	None	4.9E-05
Ammonia-N (Annual)	N	0.39046	0.267	0.19352	0.046155	0	0	0	5.7E+00 mg/L	1.0E+00 mg/L	None	None	1.5E+00 mg/L	2.9E-01 mg/L	None
Ammonia-N (Wet Season)	N	0.39046	0.267	0.19352	0.030967	0	0	0	5.7E+00 mg/L	1.8E+00 mg/L	None	None	1.5E+00 mg/L	4.7E-01 mg/L	None
Anthracene	N	0	0	0	0	0	0	0	None	None	8.3E+03	4.0E+04	None	None	8.3E+02
Antimony	N	0	0	0	0	0	0	0	None	None	5.6E+00	6.4E+02	None	None	5.6E-01
Arsenic	N	0	0	0	0	0	0	0	3.4E+02	1.5E+02	1.0E+01	None	8.5E+01	3.8E+01	1.0E+00
Barium	N	0	0	0	0	0	0	0	None	None	2.0E+03	None	None	None	2.0E+02
Benzene	Y	0	0	0	0	0	0	0	None	None	2.2E+01	5.1E+02	None	None	2.2E+00
Benzidine	Y	0	0	0	0	0	0	0	None	None	8.6E-04	2.0E-03	None	None	8.6E-05
Benzo(a)anthracene	Y	0	0	0	0	0	0	0	None	None	3.8E-02	1.8E-01	None	None	3.8E-03
Benzo(a)pyrene	Y	0	0	0	0	0	0	0	None	None	3.8E-02	1.8E-01	None	None	3.8E-03
Benzo(b)fluoranthene	Y	0	0	0	0	0	0	0	None	None	3.8E-02	1.8E-01	None	None	3.8E-03
Benzo(k)fluoranthene	Y	0	0	0	0	0	0	0	None	None	3.8E-02	1.8E-01	None	None	3.8E-03
Bis2-Chloroethyl Ether	Y	0	0	0	0	0	0	0	None	None	3.0E-01	5.3E+00	None	None	3.0E-02
Bis2-Chloroisopropyl Ether	N	0	0	0	0	0	0	0	None	None	1.4E+03	6.5E+04	None	None	1.4E+02
Bis2-Ethylehexyl Phthalate	Y	0	0	0	0	0	0	0	None	None	1.2E+01	2.2E+01	None	None	1.2E+00
Bromoform	Y	0	0	0	0	0	0	0	None	None	4.3E+01	1.4E+03	None	None	4.3E+00
Butyl Benzyl Phthalate	N	0	0	0	0	0	0	0	None	None	1.5E+03	1.9E+03	None	None	1.5E+02
Cadmium	N	0	0	0	0	0	0	0	2.9E+00	9.1E-01	5.0E+00	None	7.2E-01	2.3E-01	5.0E-01
Carbon Tetrachloride	Y	0	0	0	0	0	0	0	None	None	2.3E+00	1.6E+01	None	None	2.3E-01
Chlordane	Y	0	0	0	0	0	0	0	2.4E+00	4.3E-03	8.0E-03	8.1E-03	6.0E-01	1.1E-03	8.0E-04
Chloride	N	0	0	0	0	0	0	0	8.6E+02 mg/L	2.3E+02 mg/L	2.5E+02 mg/L	None	2.2E+02 mg/L	5.8E+01 mg/L	2.5E+01
Chlorine, Total Residual	N	0	0	0	0	0	0	0	1.9E-02 mg/L	1.1E-02 mg/L	None	None	4.8E-03 mg/L	2.8E-03 mg/L	None
Chlorobenzene	N	0	0	0	0	0	0	0	None	None	1.3E+02	1.6E+03	None	None	1.3E+01
Chlorodibromomethane	Y	0	0	0	0	0	0	0	None	None	4.0E+00	1.3E+02	None	None	4.0E-01
Chloroform	N	0	0	0	0	0	0	0	None	None	3.4E+02	1.1E+04	None	None	3.4E+01
2-Chloronaphthalene	N	0	0	0	0	0	0	0	None	None	1.0E+03	1.6E+03	None	None	1.0E+02
2-Chlorophenol	N	0	0	0	0	0	0	0	None	None	8.1E+01	1.5E+02	None	None	8.1E+00
Chlorpyrifos	N	0	0	0	0	0	0	0	8.3E-02	4.1E-02	None	None	2.1E-02	1.0E-02	None
Chromium (+3)	N	0	0	0	0	0	0	0	4.6E+02	5.9E+01	None	None	1.1E+02	1.5E+01	None
Chromium (+6)	N	0	0	0	0	0	0	0	1.6E+01	1.1E+01	None	None	4.0E+00	2.8E+00	None
Total Chromium	N	0	0	0	0	0	0	0	None	None	1.0E+02	None	None	None	1.0E+01
Chrysene	Y	0	0	0	0	0	0	0	None	None	3.8E-03	1.8E-02	None	None	3.8E-04
Copper	N	19.4673	13.31	9.64842	0.645	0.645	0.645	#REF!	1.0E+01	7.1E+00	1.3E+03	None	3.1E+00	2.3E+00	#REF!
Cyanide, Free	N	0	0	0	0	0	0	0	2.2E+01	5.2E+00	1.4E+02	1.6E+04	5.5E+00	1.3E+00	1.4E+01
DDD	Y	0	0	0	0	0	0	0	None	None	3.1E-03	3.1E-03	None	None	3.1E-04
DDE	Y	0	0	0	0	0	0	0	None	None	2.2E-03	2.2E-03	None	None	2.2E-04
DDT	Y	0	0	0	0	0	0	0	1.1E+00	1.0E-03	2.2E-03	2.2E-03	2.8E-01	2.5E-04	2.2E-04
Demeton	N	0	0	0	0	0	0	0	None	1.0E-01	None	None	None	2.5E-02	None
Diazinon	N	0	0	0	0	0	0	0	1.7E-01	1.7E-01	None	None	4.3E-02	4.3E-02	None
Dibenz(a,h)anthracene	Y	0	0	0	0	0	0	0	None	None	3.8E-02	1.8E-01	None	None	3.8E-03
1,2-Dichlorobenzene	N	0	0	0	0	0	0	0	None	None	4.2E+02	1.3E+03	None	None	4.2E+01
1,3-Dichlorobenzene	N	0	0	0	0	0	0	0	None	None	3.2E+02	9.6E+02	None	None	3.2E+01
1,4-Dichlorobenzene	N	0	0	0	0	0	0	0	None	None	6.3E+01	1.9E+02	None	None	6.3E+00
3,3-Dichlorobenzidine	Y	0	0	0	0	0	0	0	None	None	2.1E-01	2.8E-01	None	None	2.1E-02
Dichlorobromomethane	Y	0	0	0	0	0	0	0	None	None	5.5E+00	1.7E+02	None	None	5.5E-01
1,2-Dichloroethane	Y	0	0	0	0	0	0	0	None	None	3.8E+00	3.7E+02	None	None	3.8E-01
1,1-Dichloroethylene	N	0	0	0	0	0	0	0	None	None	3.3E+02	7.1E+03	None	None	3.3E+01
1,2-trans-dichloroethylene	N	0	0	0	0	0	0	0	None	None	1.4E+02	1.0E+04	None	None	1.4E+01
2,4-Dichlorophenol	N	0	0	0	0	0	0	0	None	None	7.7E+01	2.9E+02	None	None	7.7E+00
2,4-Dichlorophenoxy Acetic Acid	N	0	0	0	0	0	0	0	None	None	1.0E+02	None	None	None	1.0E+01
1,2-Dichloropropane	Y	0	0	0	0	0	0	0	None	None	5.0E+00	1.5E+02	None	None	5.0E-01
1,3-Dichloropropene	Y	0	0	0	0	0	0	0	None	None	3.4E+00	2.1E+02	None	None	3.4E-01
Dieldrin	Y	0	0	0	0	0	0	0	2.4E-01	5.6E-02	5.2E-04	5.4E-04	6.0E-02	1.4E-02	5.2E-05
Diethyl Phthalate	N	0	0	0	0	0	0	0	None	None	1.7E+04	4.4E+04	None	None	1.7E+03
2,4 Dimethylphenol	N	0	0	0	0	0	0	0	None	None	3.8E+02	8.5E+02	None	None	3.8E+01
Dimethyl Phthalate	N	0	0	0	0	0	0	0	None	None	2.7E+05	1.1E+06	None	None	2.7E+04
Di-n-Butyl Phthalate	N	0	0	0	0	0	0	0	None	None	2.0E+03	4.5E+03	None	None	2.0E+02
2,4 Dinitrophenol	N	0	0	0	0	0	0	0	None	None	6.9E+01	5.3E+03	None	None	6.9E+00
2-Methyl-4,6-Dinitrophenol	N	0	0	0	0	0	0	0	None	None	1.3E+01	2.8E+02	None	None	1.3E+00
2,4-Dinitrotoluene	Y	0	0	0	0	0	0	0	None	None	1.1E+00	3.4E+01	None	None	1.1E-01
Dioxin +	N	0	0	0	0	0	0	0	None	None	5.0E-08	5.1E-08	None	None	5.0E-09
1,2-Diphenylhydrazine	Y	0	0	0	0	0	0	0	None	None	3.6E-01	2.0E+00	None	None	3.6E-02
Alpha-Endosulfan	N	0	0	0	0	0	0	0	2.2E-01	5.6E-02	6.2E+01	8.9E+01	5.5E-02	1.4E-02	6.2E+00
Beta-Endosulfan	N	0	0	0	0	0	0	0	2.2E-01	5.6E-02	6.2E+01	8.9E+01	5.5E-02	1.4E-02	6.2E+00
Alpha+Beta-Endosulfan	N	0	0	0	0	0	0	0	2.2E-01	5.6E-02	None	None	5.5E-02	1.4E-02	None
Endosulfan Sulfate	N	0	0	0	0	0	0	0	None	None	6.2E+01	8.9E+01	None	None	6.2E+00

Facility Name:	Permit No.:
Christiansburg Wastewater Treatment Facility	VA0061751
Receiving Stream:	Date:
New River	6/9/2010

PRE - DISCHARGE WATER QUALITY CRITERIA

0.000 MGD Discharge Flow - 100% Stream Mix

Toxic Parameter and Form	Carcinogen?	97th Percentiles of Effluent Concentrations			Expected Value of Upstream Data	Current Downstream Mix Concentrations			Aquatic Protection		Human Health		INSTREAM BASELINES		
		Daily	4-Day	30-Day		Acute	Chronic	H-Health	Acute	Chronic	Public Water Supplies	Other Surface Waters	Acute	Chronic	H-Health
Endrin	N	0	0	0	0	0	0	0	8.6E-02	3.6E-02	5.9E-02	6.0E-02	2.2E-02	9.0E-03	5.9E-03
Endrin Aldehyde	N	0	0	0	0	0	0	0	None	None	2.9E-01	3.0E-01	None	None	2.9E-02
Ethylbenzene	N	0	0	0	0	0	0	0	None	None	5.3E+02	2.1E+03	None	None	5.3E+01
Fluoranthene	N	0	0	0	0	0	0	0	None	None	1.3E+02	1.4E+02	None	None	1.3E+01
Fluorene	N	0	0	0	0	0	0	0	None	None	1.1E+03	5.3E+03	None	None	1.1E+02
Foaming Agents (MBAS)	N	0	0	0	0	0	0	0	None	None	5.0E+02	None	None	None	5.0E+01
Guthion	N	0	0	0	0	0	0	0	None	1.0E-02	None	None	None	2.5E-03	None
Heptachlor	Y	0	0	0	0	0	0	0	5.2E-01	3.8E-03	7.9E-04	7.9E-04	1.3E-01	9.5E-04	7.9E-05
Heptachlor Epoxide	Y	0	0	0	0	0	0	0	5.2E-01	3.8E-03	3.9E-04	3.9E-04	1.3E-01	9.5E-04	3.9E-05
Hexachlorobenzene	Y	0	0	0	0	0	0	0	None	None	2.8E-03	2.9E-03	None	None	2.8E-04
Hexachlorobutadiene	Y	0	0	0	0	0	0	0	None	None	4.4E+00	1.8E+02	None	None	4.4E-01
Hexachlorocyclohexane Alpha-BH(	Y	0	0	0	0	0	0	0	None	None	2.6E-02	4.9E-02	None	None	2.6E-03
Hexachlorocyclohexane Beta-BHC	Y	0	0	0	0	0	0	0	None	None	9.1E-02	1.7E-01	None	None	9.1E-03
Hexachlorocyclohexane Gamma-BHC (Lindane)	Y	0	0	0	0	0	0	0	9.5E-01	None	9.8E-01	1.8E+00	2.4E-01	None	9.8E-02
Hexachlorocyclopentadiene	N	0	0	0	0	0	0	0	None	None	4.0E+01	1.1E+03	None	None	4.0E+00
Hexachloroethane	Y	0	0	0	0	0	0	0	None	None	1.4E+01	3.3E+01	None	None	1.4E+00
Hydrogen Sulfide	N	0	0	0	0	0	0	0	None	2.0E+00	None	None	None	5.0E-01	None
Indeno(1,2,3-cd)pyrene	Y	0	0	0	0	0	0	0	None	None	3.8E-02	1.8E-01	None	None	3.8E-03
Iron	N	0	0	0	0	0	0	0	None	None	3.0E+02	None	None	None	3.0E+01
Isophorone	Y	0	0	0	0	0	0	0	None	None	3.5E+02	9.6E+03	None	None	3.5E+01
Kepone	N	0	0	0	0	0	0	0	None	Zero	None	None	None	Zero	None
Lead	N	0	0	0	0	0	0	0	8.4E+01	9.5E+00	1.5E+01	None	2.1E+01	2.4E+00	1.5E+00
Malathion	N	0	0	0	0	0	0	0	None	1.0E-01	None	None	None	2.5E-02	None
Manganese	N	0	0	0	0	0	0	0	None	None	5.0E+01	None	None	None	5.0E+00
Mercury	N	0	0	0	0	0	0	0	1.4E+00	7.7E-01	None	None	3.5E-01	1.9E-01	None
Methyl Bromide	N	0	0	0	0	0	0	0	None	None	4.7E+01	1.5E+03	None	None	4.7E+00
Methylene Chloride	Y	0	0	0	0	0	0	0	None	None	4.6E+01	5.9E+03	None	None	4.6E+00
Methoxychlor	N	0	0	0	0	0	0	0	None	3.0E-02	1.0E+02	None	None	7.5E-03	1.0E+01
Mirex	N	0	0	0	0	0	0	0	None	Zero	None	None	None	Zero	None
Nickel	N	0	0	0	0	0	0	0	1.4E+02	1.6E+01	6.1E+02	4.6E+03	3.6E+01	4.0E+00	6.1E+01
Nitrate (as N)	N	0	0	0	0	0	0	0	None	None	1.0E+01 mg/L	None	None	None	1.0E+00
Nitrobenzene	N	0	0	0	0	0	0	0	None	None	1.7E+01	6.9E+02	None	None	1.7E+00
N-Nitrosodimethylamine	Y	0	0	0	0	0	0	0	None	None	6.9E-03	3.0E+01	None	None	6.9E-04
N-Nitrosodiphenylamine	Y	0	0	0	0	0	0	0	None	None	3.3E+01	6.0E+01	None	None	3.3E+00
N-Nitrosodi-n-propylamine	Y	0	0	0	0	0	0	0	None	None	5.0E-02	5.1E+00	None	None	5.0E-03
Nonylphenol	N	0	0	0	0	0	0	0	2.8E+01	6.6E+00	None	None	7.0E+00	1.7E+00	None
Parathion	N	0	0	0	0	0	0	0	6.5E-02	1.3E-02	None	None	1.6E-02	3.3E-03	None
PCB Total	Y	0	0	0	0	0	0	0	None	1.4E-02	6.4E-04	6.4E-04	None	3.5E-03	6.4E-05
Pentachlorophenol	Y	0	0	0	0	0	0	0	1.2E+01	9.0E+00	2.7E+00	3.0E+01	2.9E+00	2.3E+00	2.7E-01
Phenol	N	0	0	0	0	0	0	0	None	None	1.0E+04	8.6E+05	None	None	1.0E+03
Pyrene	N	0	0	0	0	0	0	0	None	None	8.3E+02	4.0E+03	None	None	8.3E+01
RadNuc - Beta Part & Photon Act	N	0	0	0	0	0	0	0	None	None	4.0E+00 mrem	None	None	None	4.0E-01
RadNuc - Gross Alpha Part Act	N	0	0	0	0	0	0	0	None	None	1.5E+01 pCi/L	None	None	None	1.5E+00
RadNuc - Radium 226 + 228	N	0	0	0	0	0	0	0	None	None	5.0E+00 pCi/L	None	None	None	5.0E-01
RadNuc - Uranium	N	0	0	0	0	0	0	0	None	None	3.0E+01	None	None	None	3.0E+00
Selenium, Total Recoverable	N	0	0	0	0	0	0	0	2.0E+01	5.0E+00	1.7E+02	4.2E+03	5.0E+00	1.3E+00	1.7E+01
Silver	N	0	0	0	0	0	0	0	2.2E+00	None	None	None	5.4E-01	None	None
Sulfate	N	0	0	0	0	0	0	0	None	None	2.5E+02 mg/L	None	None	None	2.5E+01
1,1,2,2-Tetrachloroethane	Y	0	0	0	0	0	0	0	None	None	1.7E+00	4.0E+01	None	None	1.7E-01
Tetrachloroethylene	Y	0	0	0	0	0	0	0	None	None	6.9E+00	3.3E+01	None	None	6.9E-01
Thallium	N	0	0	0	0	0	0	0	None	None	2.4E-01	4.7E-01	None	None	2.4E-02
Toluene	N	0	0	0	0	0	0	0	None	None	5.1E+02	6.0E+03	None	None	5.1E+01
Total Dissolved Solids	N	0	0	0	0	0	0	0	None	None	5.0E+05	None	None	None	5.0E+04
Toxaphene	Y	0	0	0	0	0	0	0	7.3E-01	2.0E-04	2.8E-03	2.8E-03	1.8E-01	5.0E-05	2.8E-04
Tributyltin	N	0	0	0	0	0	0	0	4.6E-01	7.2E-02	None	None	1.2E-01	1.8E-02	None
1,2,4-Trichlorobenzene	N	0	0	0	0	0	0	0	None	None	3.5E+01	7.0E+01	None	None	3.5E+00
1,1,2-Trichloroethane	Y	0	0	0	0	0	0	0	None	None	5.9E+00	1.6E+02	None	None	5.9E-01
Trichloroethylene	Y	0	0	0	0	0	0	0	None	None	2.5E+01	3.0E+02	None	None	2.5E+00
2,4,6-Trichlorophenol	Y	0	0	0	0	0	0	0	None	None	1.4E+01	2.4E+01	None	None	1.4E+00
2-(2,4,5-Trichlorophenoxy propionic acid (Silvex)	N	0	0	0	0	0	0	0	None	None	5.0E+01	None	None	None	5.0E+00
Vinyl Chloride	Y	0	0	0	0	0	0	0	None	None	2.5E-01	2.4E+01	None	None	2.5E-02
Zinc	N	139.515	95.391	69.147	3.675	3.675	3.675	3.675	9.3E+01	9.4E+01	7.4E+03	2.6E+04	2.6E+01	2.6E+01	7.4E+02

Facility Name:
Christiansburg Wastewater Treatment Facility
Receiving Stream:
New River

Toxic Parameter and Form	ANTIDEGRADATION WASTE LOAD ALLOCATIONS (6.000 MGD Discharge - 100% Stream Mix)			POST - DISCHARGE WATER QUALITY CRITERIA (6.000 MGD Discharge Flow - Mix per "Mixer")				NON-ANTIDEGRADATION WASTE LOAD ALLOCATIONS (6.000 MGD Discharge - Mix per "Mixer")			MOST RESTRICTIVE WASTE LOAD ALLOCATIONS (6.000 MGD Discharge Flow)			Target
	Aquatic Protection		Human	Aquatic Protection		Human Health		Aquatic Protection		Human	Aquatic Protection		Human	
	Acute	Chronic	Health	Acute	Chronic	Public Water Supplies	Other Surface Waters	Acute	Chronic	Health	Acute	Chronic	Health	Level
Acenaphthene	N/A	N/A	8.3E+03	None	None	6.7E+02	9.9E+02	N/A	N/A	8.3E+04	N/A	N/A	8.3E+03	N/A
Acrolein	N/A	N/A	7.6E+01	None	None	6.1E+00	9.3E+00	N/A	N/A	7.6E+02	N/A	N/A	7.6E+01	N/A
Acrylonitrile	N/A	N/A	1.3E+01	None	None	5.1E-01	2.5E+00	N/A	N/A	1.3E+02	N/A	N/A	1.3E+01	N/A
Aldrin	5.9E+01	N/A	1.3E-02	3.0E+00	None	4.9E-04	5.0E-04	2.4E+02	N/A	1.3E-01	5.9E+01	N/A	1.3E-02	N/A
Ammonia-N (Annual)	1.1E+02 mg/L	2.8E+01 mg/L	N/A	6.1E+00 mg/L	1.1E+00 mg/L	None	None	4.7E+02 mg/L	1.1E+02 mg/L	N/A	1.1E+02 mg/L	2.8E+01 mg/L	N/A	N/A
Ammonia-N (Wet Season)	1.3E+02 mg/L	8.0E+01 mg/L	N/A	6.0E+00 mg/L	1.8E+00 mg/L	None	None	5.5E+02 mg/L	3.3E+02 mg/L	N/A	1.3E+02 mg/L	8.0E+01 mg/L	N/A	N/A
Anthracene	N/A	N/A	1.0E+05	None	None	8.3E+03	4.0E+04	N/A	N/A	1.0E+06	N/A	N/A	1.0E+05	N/A
Antimony	N/A	N/A	7.0E+01	None	None	5.6E+00	6.4E+02	N/A	N/A	7.0E+02	N/A	N/A	7.0E+01	7.0E+01
Arsenic	6.7E+03	3.6E+03	1.2E+02	3.4E+02	1.5E+02	1.0E+01	None	2.7E+04	1.5E+04	1.2E+03	6.7E+03	3.6E+03	1.2E+02	1.2E+02
Barium	N/A	N/A	2.5E+04	None	None	2.0E+03	None	N/A	N/A	2.5E+05	N/A	N/A	2.5E+04	2.5E+04
Benzene	N/A	N/A	5.6E+02	None	None	2.2E+01	5.1E+02	N/A	N/A	5.6E+03	N/A	N/A	5.6E+02	N/A
Benzidine	N/A	N/A	2.2E-02	None	None	8.6E-04	2.0E-03	N/A	N/A	2.2E-01	N/A	N/A	2.2E-02	N/A
Benzo(a)anthracene	N/A	N/A	9.7E-01	None	None	3.8E-02	1.8E-01	N/A	N/A	9.7E+00	N/A	N/A	9.7E-01	N/A
Benzo(a)pyrene	N/A	N/A	9.7E-01	None	None	3.8E-02	1.8E-01	N/A	N/A	9.7E+00	N/A	N/A	9.7E-01	N/A
Benzo(b)fluoranthene	N/A	N/A	9.7E-01	None	None	3.8E-02	1.8E-01	N/A	N/A	9.7E+00	N/A	N/A	9.7E-01	N/A
Benzo(k)fluoranthene	N/A	N/A	9.7E-01	None	None	3.8E-02	1.8E-01	N/A	N/A	9.7E+00	N/A	N/A	9.7E-01	N/A
Bis2-Chloroethyl Ether	N/A	N/A	7.7E+00	None	None	3.0E-01	5.3E+00	N/A	N/A	7.7E+01	N/A	N/A	7.7E+00	N/A
Bis2-Chloroisopropyl Ether	N/A	N/A	1.7E+04	None	None	1.4E+03	6.5E+04	N/A	N/A	1.7E+05	N/A	N/A	1.7E+04	N/A
Bis2-Ethylehexyl Phthalate	N/A	N/A	3.1E+02	None	None	1.2E+01	2.2E+01	N/A	N/A	3.1E+03	N/A	N/A	3.1E+02	N/A
Bromoform	N/A	N/A	1.1E+03	None	None	4.3E+01	1.4E+03	N/A	N/A	1.1E+04	N/A	N/A	1.1E+03	N/A
Butyl Benzyl Phthalate	N/A	N/A	1.9E+04	None	None	1.5E+03	1.9E+03	N/A	N/A	1.9E+05	N/A	N/A	1.9E+04	N/A
Cadmium	5.7E+01	2.2E+01	6.2E+01	2.9E+00	9.2E-01	5.0E+00	None	2.3E+02	9.0E+01	6.2E+02	5.7E+01	2.2E+01	6.2E+01	1.3E+01
Carbon Tetrachloride	N/A	N/A	5.9E+01	None	None	2.3E+00	1.6E+01	N/A	N/A	5.9E+02	N/A	N/A	5.9E+01	N/A
Chlordane	4.7E+01	1.0E-01	2.0E-01	2.4E+00	4.3E-03	8.0E-03	8.1E-03	1.9E+02	4.2E-01	2.0E+00	4.7E+01	1.0E-01	2.0E-01	N/A
Chloride mg/L	1.7E+04 mg/L	5.6E+03 mg/L	3.1E+03 mg/L	8.6E+02 mg/L	2.3E+02 mg/L	2.5E+02 mg/L	None	6.8E+04 mg/L	2.2E+04 mg/L	3.1E+04 mg/L	1.7E+04 mg/L	5.6E+03 mg/L	3.1E+03 mg/L	N/A
Chlorine, Total Residual	3.7E-01 mg/L	2.7E-01 mg/L	N/A	1.9E-02 mg/L	1.1E-02 mg/L	None	None	1.5E+00 mg/L	1.1E+00 mg/L	N/A	3.7E-01 mg/L	2.7E-01 mg/L	N/A	N/A
Chlorobenzene	N/A	N/A	1.6E+03	None	None	1.3E+02	1.6E+03	N/A	N/A	1.6E+04	N/A	N/A	1.6E+03	N/A
Chlorodibromomethane	N/A	N/A	1.0E+02	None	None	4.0E+00	1.3E+02	N/A	N/A	1.0E+03	N/A	N/A	1.0E+02	N/A
Chloroform	N/A	N/A	4.2E+03	None	None	3.4E+02	1.1E+04	N/A	N/A	4.2E+04	N/A	N/A	4.2E+03	N/A
2-Chloronaphthalene	N/A	N/A	1.2E+04	None	None	1.0E+03	1.6E+03	N/A	N/A	1.2E+05	N/A	N/A	1.2E+04	N/A
2-Chlorophenol	N/A	N/A	1.0E+03	None	None	8.1E+01	1.5E+02	N/A	N/A	1.0E+04	N/A	N/A	1.0E+03	N/A
Chlorpyrifos	1.6E+00	1.0E+00	N/A	8.3E-02	4.1E-02	None	None	6.5E+00	4.0E+00	N/A	1.6E+00	1.0E+00	N/A	N/A
Chromium (+3)	9.0E+03	1.4E+03	N/A	4.6E+02	6.0E+01	None	None	3.6E+04	5.8E+03	N/A	9.0E+03	1.4E+03	N/A	8.6E+02
Chromium (+6)	3.2E+02	2.7E+02	N/A	1.6E+01	1.1E+01	None	None	1.3E+03	1.1E+03	N/A	3.2E+02	2.7E+02	N/A	1.3E+02
Total Chromium	N/A	N/A	1.2E+03	None	None	1.0E+02	None	N/A	N/A	1.2E+04	N/A	N/A	1.2E+03	1.2E+03
Chrysene	N/A	N/A	9.7E-02	None	None	4.4E-02	4.9E-01	N/A	N/A	1.1E+01	N/A	N/A	9.7E-02	N/A
Copper	1.9E+02	1.6E+02	#REF!	1.1E+01	7.2E+00	1.3E+03	None	7.8E+02	6.3E+02	1.6E+05	1.9E+02	1.6E+02	#REF!	#REF!
Cyanide, Free	4.3E+02	1.3E+02	1.7E+03	2.2E+01	5.2E+00	1.4E+02	1.6E+04	1.7E+03	5.1E+02	1.7E+04	4.3E+02	1.3E+02	1.7E+03	N/A
DDD	N/A	N/A	7.9E-02	None	None	3.1E-03	3.1E-03	N/A	N/A	7.9E-01	N/A	N/A	7.9E-02	N/A
DDE	N/A	N/A	5.6E-02	None	None	2.2E-03	2.2E-03	N/A	N/A	5.6E-01	N/A	N/A	5.6E-02	N/A
DDT	2.2E+01	2.4E-02	5.6E-02	1.1E+00	1.0E-03	2.2E-03	2.2E-03	8.7E+01	9.7E-02	5.6E-01	2.2E+01	2.4E-02	5.6E-02	N/A
Demeton	N/A	2.4E+00	N/A	None	1.0E-01	None	None	N/A	9.7E+00	N/A	N/A	2.4E+00	N/A	N/A
Diazinon	3.4E+00	4.1E+00	N/A	1.7E-01	1.7E-01	None	None	1.3E+01	1.7E+01	N/A	3.4E+00	4.1E+00	N/A	N/A
Dibenz(a,h)anthracene	N/A	N/A	9.7E-01	None	None	3.8E-02	1.8E-01	N/A	N/A	9.7E+00	N/A	N/A	9.7E-01	N/A
1,2-Dichlorobenzene	N/A	N/A	5.2E+03	None	None	4.2E+02	1.3E+03	N/A	N/A	5.2E+04	N/A	N/A	5.2E+03	N/A
1,3-Dichlorobenzene	N/A	N/A	4.0E+03	None	None	3.2E+02	9.6E+02	N/A	N/A	4.0E+04	N/A	N/A	4.0E+03	N/A
1,4-Dichlorobenzene	N/A	N/A	7.8E+02	None	None	6.3E+01	1.9E+02	N/A	N/A	7.8E+03	N/A	N/A	7.8E+02	N/A
3,3-Dichlorobenzidine	N/A	N/A	5.4E+00	None	None	2.1E-01	2.8E-01	N/A	N/A	5.4E+01	N/A	N/A	5.4E+00	N/A
Dichlorobromomethane	N/A	N/A	1.4E+02	None	None	5.5E+00	1.7E+02	N/A	N/A	1.4E+03	N/A	N/A	1.4E+02	N/A
1,2-Dichloroethane	N/A	N/A	9.7E+01	None	None	3.8E+00	3.7E+02	N/A	N/A	9.7E+02	N/A	N/A	9.7E+01	N/A
1,1-Dichloroethylene	N/A	N/A	4.1E+03	None	None	3.3E+02	7.1E+03	N/A	N/A	4.1E+04	N/A	N/A	4.1E+03	N/A
1,2-trans-dichloroethylene	N/A	N/A	1.7E+03	None	None	1.4E+02	1.0E+04	N/A	N/A	1.7E+04	N/A	N/A	1.7E+03	N/A
2,4-Dichlorophenol	N/A	N/A	9.6E+02	None	None	7.7E+01	2.9E+02	N/A	N/A	9.6E+03	N/A	N/A	9.6E+02	N/A
2,4-Dichlorophenoxy Acetic Acid	N/A	N/A	1.2E+03	None	None	1.0E+02	None	N/A	N/A	1.2E+04	N/A	N/A	1.2E+03	N/A
1,2-Dichloropropane	N/A	N/A	1.3E+02	None	None	5.0E+00	1.5E+02	N/A	N/A	1.3E+03	N/A	N/A	1.3E+02	N/A
1,3-Dichloropropene	N/A	N/A	8.7E+01	None	None	3.4E+00	2.1E+02	N/A	N/A	8.7E+02	N/A	N/A	8.7E+01	N/A
Dieldrin	4.7E+00	1.4E+00	1.3E-02	2.4E-01	5.6E-02	5.2E-04	5.4E-04	1.9E+01	5.4E+00	1.3E-01	4.7E+00	1.4E+00	1.3E-02	N/A
Diethyl Phthalate	N/A	N/A	2.1E+05	None	None	1.7E+04	4.4E+04	N/A	N/A	2.1E+06	N/A	N/A	2.1E+05	N/A
2,4 Dimethylphenol	N/A	N/A	4.7E+03	None	None	3.8E+02	8.5E+02	N/A	N/A	4.7E+04	N/A	N/A	4.7E+03	N/A
Dimethyl Phthalate	N/A	N/A	3.4E+06	None	None	2.7E+05	1.1E+06	N/A	N/A	3.4E+07	N/A	N/A	3.4E+06	N/A
Di-n-Butyl Phthalate	N/A	N/A	2.5E+04	None	None	2.0E+03	4.5E+03	N/A	N/A	2.5E+05	N/A	N/A	2.5E+04	N/A
2,4 Dinitrophenol	N/A	N/A	8.6E+02	None	None	6.9E+01	5.3E+03	N/A	N/A	8.6E+03	N/A	N/A	8.6E+02	N/A
2-Methyl-4,6-Dinitrophenol	N/A	N/A	1.6E+02	None	None	1.3E+01	2.8E+02	N/A	N/A	1.6E+03	N/A	N/A	1.6E+02	N/A
2,4-Dinitrotoluene	N/A	N/A	2.8E+01	None	None	1.1E+00	3.4E+01	N/A	N/A	2.8E+02	N/A	N/A	2.8E+01	N/A
Dioxin +	N/A	N/A	6.2E-07	None	None	5.0E-08	5.1E-08	N/A	N/A	6.2E-06	N/A	N/A	6.2E-07	N/A
1,2-Diphenylhydrazine	N/A	N/A	9.2E+00	None	None	3.6E-01	2.0E+00	N/A	N/A	9.2E+01	N/A	N/A	9.2E+00	N/A
Alpha-Endosulfan	4.3E+00	1.4E+00	7.7E+02	2.2E-01	5.6E-02	6.2E+01	8.9E+01	1.7E+01	5.4E+00	7.7E+03	4.3E+00	1.4E+00	7.7E+02	N/A
Beta-Endosulfan	4.3E+00	1.4E+00	7.7E+02	2.2E-01	5.6E-02	6.2E+01	8.9E+01	1.7E+01	5.4E+00	7.7E+03	4.3E+00	1.4E+00	7.7E+02	N/A
Alpha+Beta-Endosulfan	4.3E+00	1.4E+00	N/A	2.2E-01	5.6E-02	None	None	1.7E+01	5.4E+00	N/A	4.3E+00	1.4E+00	N/A	N/A
Endosulfan Sulfate	N/A	N/A	7.7E+02	None	None	6.2E+01	8.9E+01	N/A	N/A	7.7E+03	N/A	N/A	7.7E+02	N/A

Facility Name:
Christiansburg Wastewater Treatment Facility
Receiving Stream:
New River

Toxic Parameter and Form		ANTIDEGRADATION WASTE LOAD ALLOCATIONS (6.000 MGD Discharge - 100% Stream Mix)			POST - DISCHARGE WATER QUALITY CRITERIA (6.000 MGD Discharge Flow - Mix per "Mixer")				NON-ANTIDEGRADATION WASTE LOAD ALLOCATIONS (6.000 MGD Discharge - Mix per "Mixer")			MOST RESTRICTIVE WASTE LOAD ALLOCATIONS (6.000 MGD Discharge Flow)			Target
		Aquatic Protection		Human Health	Aquatic Protection		Human Health		Aquatic Protection		Human Health	Aquatic Protection		Human Health	Level
		Acute	Chronic		Acute	Chronic	Public Water Supplies	Other Surface Waters	Acute	Chronic		Acute	Chronic		
Endrin		1.7E+00	8.7E-01	7.3E-01	8.6E-02	3.6E-02	5.9E-02	6.0E-02	6.8E+00	3.5E+00	7.3E+00	1.7E+00	8.7E-01	7.3E-01	N/A
Endrin Aldehyde		N/A	N/A	3.6E+00	None	None	2.9E-01	3.0E-01	N/A	N/A	3.6E+01	N/A	N/A	3.6E+00	N/A
Ethylbenzene		N/A	N/A	6.6E+03	None	None	5.3E+02	2.1E+03	N/A	N/A	6.6E+04	N/A	N/A	6.6E+03	N/A
Fluoranthene		N/A	N/A	1.6E+03	None	None	1.3E+02	1.4E+02	N/A	N/A	1.6E+04	N/A	N/A	1.6E+03	N/A
Fluorene		N/A	N/A	1.4E+04	None	None	1.1E+03	5.3E+03	N/A	N/A	1.4E+05	N/A	N/A	1.4E+04	N/A
Foaming Agents (MBAS)		N/A	N/A	6.2E+03	None	None	5.0E+02	None	N/A	N/A	6.2E+04	N/A	N/A	6.2E+03	N/A
Guthion		N/A	2.4E-01	N/A	None	1.0E-02	None	None	N/A	9.7E-01	N/A	N/A	2.4E-01	N/A	N/A
Heptachlor		1.0E+01	9.2E-02	2.0E-02	5.2E-01	3.8E-03	7.9E-04	7.9E-04	4.1E+01	3.7E-01	2.0E-01	1.0E+01	9.2E-02	2.0E-02	N/A
Heptachlor Epoxide		1.0E+01	9.2E-02	1.0E-02	5.2E-01	3.8E-03	3.9E-04	3.9E-04	4.1E+01	3.7E-01	1.0E-01	1.0E+01	9.2E-02	1.0E-02	N/A
Hexachlorobenzene		N/A	N/A	7.2E-02	None	None	2.8E-03	2.9E-03	N/A	N/A	7.2E-01	N/A	N/A	7.2E-02	N/A
Hexachlorobutadiene		N/A	N/A	1.1E+02	None	None	4.4E+00	1.8E+02	N/A	N/A	1.1E+03	N/A	N/A	1.1E+02	N/A
Hexachlorocyclohexane Alpha-BH(		N/A	N/A	6.6E-01	None	None	2.6E-02	4.9E-02	N/A	N/A	6.6E+00	N/A	N/A	6.6E-01	N/A
Hexachlorocyclohexane Beta-BHC		N/A	N/A	2.3E+00	None	None	9.1E-02	1.7E-01	N/A	N/A	2.3E+01	N/A	N/A	2.3E+00	N/A
Hexachlorocyclohexane Gamma-BHC (Lindane)		1.9E+01	N/A	2.5E+01	9.5E-01	None	9.8E-01	1.8E+00	7.5E+01	N/A	2.5E+02	1.9E+01	N/A	2.5E+01	N/A
Hexachlorocyclopentadiene		N/A	N/A	5.0E+02	None	None	4.0E+01	1.1E+03	N/A	N/A	5.0E+03	N/A	N/A	5.0E+02	N/A
Hexachloroethane		N/A	N/A	3.6E+02	None	None	1.4E+01	3.3E+01	N/A	N/A	3.6E+03	N/A	N/A	3.6E+02	N/A
Hydrogen Sulfide		N/A	4.9E+01	N/A	None	2.0E+00	None	None	N/A	1.9E+02	N/A	N/A	4.9E+01	N/A	N/A
Indeno(1,2,3-cd)pyrene		N/A	N/A	9.7E-01	None	None	3.8E-02	1.8E-01	N/A	N/A	9.7E+00	N/A	N/A	9.7E-01	N/A
Iron		N/A	N/A	3.7E+03	None	None	3.0E+02	None	N/A	N/A	3.7E+04	N/A	N/A	3.7E+03	3.7E+03
Isophorone		N/A	N/A	8.9E+03	None	None	3.5E+02	9.6E+03	N/A	N/A	8.9E+04	N/A	N/A	8.9E+03	N/A
Kepone		N/A	Zero	N/A	None	Zero	None	None	N/A	Zero	N/A	N/A	Zero	N/A	N/A
Lead		1.7E+03	2.3E+02	1.9E+02	8.6E+01	9.7E+00	1.5E+01	None	6.8E+03	9.4E+02	1.9E+03	1.7E+03	2.3E+02	1.9E+02	1.4E+02
Malathion		N/A	2.4E+00	N/A	None	1.0E-01	None	None	N/A	9.7E+00	N/A	N/A	2.4E+00	N/A	N/A
Manganese		N/A	N/A	6.2E+02	None	None	5.0E+01	None	N/A	N/A	6.2E+03	N/A	N/A	6.2E+02	6.2E+02
Mercury		2.8E+01	1.9E+01	N/A	1.4E+00	7.7E-01	None	None	1.1E+02	7.5E+01	N/A	2.8E+01	1.9E+01	N/A	1.1E+01
Methyl Bromide		N/A	N/A	5.9E+02	None	None	4.7E+01	1.5E+03	N/A	N/A	5.9E+03	N/A	N/A	5.9E+02	N/A
Methylene Chloride		N/A	N/A	1.2E+03	None	None	4.6E+01	5.9E+03	N/A	N/A	1.2E+04	N/A	N/A	1.2E+03	N/A
Methoxychlor		N/A	7.3E-01	1.2E+03	None	3.0E-02	1.0E+02	None	N/A	2.9E+00	1.2E+04	N/A	7.3E-01	1.2E+03	N/A
Mirex		N/A	Zero	N/A	None	Zero	None	None	N/A	Zero	N/A	N/A	Zero	N/A	N/A
Nickel		2.8E+03	3.9E+02	7.6E+03	1.5E+02	1.6E+01	6.1E+02	4.6E+03	1.2E+04	1.6E+03	7.6E+04	2.8E+03	3.9E+02	7.6E+03	2.3E+02
Nitrate (as N)	mg/L	N/A	N/A	1.2E+02 mg/L	None	None	1.0E+01 mg/L	None	N/A	N/A	1.2E+03 mg/L	N/A	N/A	1.2E+02 mg/L	N/A
Nitrobenzene		N/A	N/A	2.1E+02	None	None	1.7E+01	6.9E+02	N/A	N/A	2.1E+03	N/A	N/A	2.1E+02	N/A
N-Nitrosodimethylamine		N/A	N/A	1.8E-01	None	None	6.9E-03	3.0E+01	N/A	N/A	1.8E+00	N/A	N/A	1.8E-01	N/A
N-Nitrosodiphenylamine		N/A	N/A	8.4E+02	None	None	3.3E+01	6.0E+01	N/A	N/A	8.4E+03	N/A	N/A	8.4E+02	N/A
N-Nitrosodi-n-propylamine		N/A	N/A	1.3E+00	None	None	5.0E-02	5.1E+00	N/A	N/A	1.3E+01	N/A	N/A	1.3E+00	N/A
Nonylphenol		5.5E+02	1.6E+02	N/A	2.8E+01	6.6E+00	None	None	2.2E+03	6.4E+02	N/A	5.5E+02	1.6E+02	N/A	N/A
Parathion		1.3E+00	3.2E-01	N/A	6.5E-02	1.3E-02	None	None	5.1E+00	1.3E+00	N/A	1.3E+00	3.2E-01	N/A	N/A
PCB Total		N/A	3.4E-01	1.6E-02	None	1.4E-02	6.4E-04	6.4E-04	N/A	1.4E+00	1.6E-01	N/A	3.4E-01	1.6E-02	N/A
Pentachlorophenol		2.3E+02	2.2E+02	6.9E+01	1.2E+01	9.0E+00	2.7E+00	3.0E+01	9.2E+02	8.7E+02	6.9E+02	2.3E+02	2.2E+02	6.9E+01	N/A
Phenol		N/A	N/A	1.2E+05	None	None	1.0E+04	8.6E+05	N/A	N/A	1.2E+06	N/A	N/A	1.2E+05	N/A
Pyrene		N/A	N/A	1.0E+04	None	None	8.3E+02	4.0E+03	N/A	N/A	1.0E+05	N/A	N/A	1.0E+04	N/A
RadNuc - Beta Part & Photon Act	mrem	N/A	N/A	5.0E+01 mrem	None	None	4.0E+00 mrem	4.0E+00 mre	N/A	N/A	5.0E+02 mrem	N/A	N/A	5.0E+01 mrem	N/A
RadNuc - Gross Alpha Part Act	pCi/L	N/A	N/A	1.9E+02 pCi/L	None	None	1.5E+01 pCi/L	None	N/A	N/A	1.9E+03 pCi/L	N/A	N/A	1.9E+02 pCi/L	N/A
RadNuc - Radium 226 + 228	pCi/L	N/A	N/A	6.2E+01 pCi/L	None	None	5.0E+00 pCi/L	None	N/A	N/A	6.2E+02 pCi/L	N/A	N/A	6.2E+01 pCi/L	N/A
RadNuc - Uranium		N/A	N/A	3.7E+02	None	None	3.0E+01	None	N/A	N/A	3.7E+03	N/A	N/A	3.7E+02	N/A
Selenium, Total Recoverable		3.9E+02	1.2E+02	2.1E+03	2.0E+01	5.0E+00	1.7E+02	4.2E+03	1.6E+03	4.9E+02	2.1E+04	3.9E+02	1.2E+02	2.1E+03	7.3E+01
Silver		4.2E+01	N/A	N/A	2.2E+00	None	None	None	1.7E+02	N/A	N/A	4.2E+01	N/A	N/A	1.7E+01
Sulfate	mg/L	N/A	N/A	3.1E+03 mg/L	None	None	2.5E+02 mg/L	None	N/A	N/A	3.1E+04 mg/L	N/A	N/A	3.1E+03 mg/L	N/A
1,1,2,2-Tetrachloroethane		N/A	N/A	4.3E+01	None	None	1.7E+00	4.0E+01	N/A	N/A	4.3E+02	N/A	N/A	4.3E+01	N/A
Tetrachloroethylene		N/A	N/A	1.8E+02		None	6.9E+00	3.3E+01	0.0E+00	N/A	1.8E+03	N/A	N/A	1.8E+02	N/A
Thallium		N/A	N/A	3.0E+00	None	None	2.4E-01	4.7E-01	N/A	N/A	3.0E+01	N/A	N/A	3.0E+00	N/A
Toluene		N/A	N/A	6.3E+03	None	None	5.1E+02	6.0E+03	N/A	N/A	6.3E+04	N/A	N/A	6.3E+03	N/A
Total Dissolved Solids		N/A	N/A	6.2E+06	None	None	5.0E+05	None	N/A	N/A	6.2E+07	N/A	N/A	6.2E+06	N/A
Toxaphene		1.4E+01	4.9E-03	7.2E-02	7.3E-01	2.0E-04	2.8E-03	2.8E-03	5.8E+01	1.9E-02	7.2E-01	1.4E+01	4.9E-03	7.2E-02	N/A
Tributyltin		9.1E+00	1.7E+00	N/A	4.6E-01	7.2E-02	None	None	3.6E+01	7.0E+00	N/A	9.1E+00	1.7E+00	N/A	N/A
1,2,4-Trichlorobenzene		N/A	N/A	4.4E+02	None	None	3.5E+01	7.0E+01	N/A	N/A	4.4E+03	N/A	N/A	4.4E+02	N/A
1,1,2-Trichloroethane		N/A	N/A	1.5E+02	None	None	5.9E+00	1.6E+02	N/A	N/A	1.5E+03	N/A	N/A	1.5E+02	N/A
Trichloroethylene		N/A	N/A	6.4E+02	None	None	2.5E+01	3.0E+02	N/A	N/A	6.4E+03	N/A	N/A	6.4E+02	N/A
2,4,6-Trichlorophenol		N/A	N/A	3.6E+02	None	None	1.4E+01	2.4E+01	N/A	N/A	3.6E+03	N/A	N/A	3.6E+02	N/A
2-(2,4,5-Trichlorophenoxy propionic acid (Silvex)		N/A	N/A	6.2E+02	None	None	5.0E+01	None	N/A	N/A	6.2E+03	N/A	N/A	6.2E+02	N/A
Vinyl Chloride		N/A	N/A	6.4E+00	None	None	2.5E-01	2.4E+01	N/A	N/A	6.4E+01	N/A	N/A	6.4E+00	N/A
Zinc		1.8E+03	2.2E+03	9.2E+04	9.4E+01	9.5E+01	7.4E+03	2.6E+04	7.1E+03	8.8E+03	9.2E+05	1.8E+03	2.2E+03	9.2E+04	7.0E+02

WATER QUALITY CRITERIA / WASTE LOAD ALLOCATION ANALYSIS

Facility Name:
Christiansburg Wastewater Treatment Facility
Receiving Stream:
New River

Permit No.: VA0061751
Date: 6/9/2010

Version: OWP Guidance Memo 00-2011 (8/24/00)

Stream Information		Stream Flows		Mixing Information			Effluent Information	
Mean Hardness (as CaCO3) =	76 mg/L	1Q10 (Annual) =	467 MGD	Annual	- 1Q10 Flow =	100 %	Mean Hardness (as CaCO3) =	176 mg/L
90% Temperature (Annual) =	23 deg C	7Q10 (Annual) =	577 MGD		- 7Q10 Flow =	100 %	90% Temp (Annual) =	21 deg C
90% Temperature (Wet season) =	14 deg C	30Q10 (Annual) =	663 MGD		- 30Q10 Flow =	100 %	90% Temp (Wet season) =	17 deg C
90% Maximum pH =	8.2 SU	1Q10 (Wet season) =	546 MGD	Wet Season	- 1Q10 Flow =	100 %	90% Maximum pH =	7.4 SU
10% Maximum pH =	7.3 SU	30Q10 (Wet season) =	1079 MGD		- 30Q10 Flow =	100 %	10% Maximum pH =	6.8 SU
Tier Designation =	2	30Q5 =	741 MGD				1992 Discharge Flow =	0.000 MGD
Public Water Supply (PWS) Y/N? =	Y	Harmonic Mean =	1527 MGD				Discharge Flow for Limit Analysis =	8.000 MGD
V(alley) or P(iedmont)? =	V							
Trout Present Y/N? =	N							
Early Life Stages Present Y/N? =	Y							

Footnotes:

1. All concentrations expressed as micrograms/liter (ug/l), unless noted otherwise.
2. All flow values are expressed as Million Gallons per Day (MGD).
3. Discharge volumes are highest monthly average or 2C maximum for Industries and design flows for Municipals.
4. Hardness expressed as mg/l CaCO3. Standards calculated using Hardness values in the range of 25-400 mg/l CaCO3.
5. "Public Water Supply" protects for fish & water consumption. "Other Surface Waters" protects for fish consumption only.
6. Carcinogen "Y" indicates carcinogenic parameter.
7. Ammonia WQSs selected from separate tables, based on pH and temperature.
8. Metals measured as Dissolved, unless specified otherwise.
9. WLA = Waste Load Allocation (based on standards).
10. WLA = Waste Load Allocation (based on standards).
11. WLAs are based on mass balances (less background, if data exist).
12. Acute - 1 hour avg. concentration not to be exceeded more than 1/3 years.
13. Chronic - 4 day avg. concentration (30 day avg. for Ammonia) not to be exceeded more than 1/3 years.
14. Mass balances employ 1Q10 for Acute, 30Q10 for Chronic Ammonia, 7Q10 for Other Chronic, 30Q5 for Non-carcinogens, and Harmonic Mean for Carcinogens. Actual flows employed are a function of the mixing analysis and may be less than the actual flows
15. Effluent Limitations are calculated elsewhere using the minimum WLA and EPA's statistical approach (Technical Support Document).

Facility Name:	Permit No.:
Christiansburg Wastewater Treatment Facility	VA0061751
Receiving Stream:	Date:
New River	6/9/2010

PRE - DISCHARGE WATER QUALITY CRITERIA

0.000 MGD Discharge Flow - 100% Stream Mix

Toxic Parameter and Form	Carcinogen?	97th Percentiles of Effluent Concentrations			Expected Value of Upstream Data	Current Downstream Mix Concentrations			Aquatic Protection		Human Health		INSTREAM BASELINES		
		Daily	4-Day	30-Day		Acute	Chronic	H-Health	Acute	Chronic	Public Water Supplies	Other Surface Waters	Acute	Chronic	H-Health
Acenaphthene	N	0	0	0	0	0	0	0	None	None	6.7E+02	9.9E+02	None	None	6.7E+01
Acrolein	N	0	0	0	0	0	0	0	None	None	6.1E+00	9.3E+00	None	None	6.1E-01
Acrylonitrile	Y	0	0	0	0	0	0	0	None	None	5.1E-01	2.5E+00	None	None	5.1E-02
Aldrin	Y	0	0	0	0	0	0	0	3.0E+00	None	4.9E-04	5.0E-04	7.5E-01	None	4.9E-05
Ammonia-N (Annual)	N	0.39046	0.267	0.19352	0.046155	0	0	0	5.7E+00 mg/L	1.0E+00 mg/L	None	None	1.5E+00 mg/L	2.9E-01 mg/L	None
Ammonia-N (Wet Season)	N	0.39046	0.267	0.19352	0.030967	0	0	0	5.7E+00 mg/L	1.8E+00 mg/L	None	None	1.5E+00 mg/L	4.7E-01 mg/L	None
Anthracene	N	0	0	0	0	0	0	0	None	None	8.3E+03	4.0E+04	None	None	8.3E+02
Antimony	N	0	0	0	0	0	0	0	None	None	5.6E+00	6.4E+02	None	None	5.6E-01
Arsenic	N	0	0	0	0	0	0	0	3.4E+02	1.5E+02	1.0E+01	None	8.5E+01	3.8E+01	1.0E+00
Barium	N	0	0	0	0	0	0	0	None	None	2.0E+03	None	None	None	2.0E+02
Benzene	Y	0	0	0	0	0	0	0	None	None	2.2E+01	5.1E+02	None	None	2.2E+00
Benzidine	Y	0	0	0	0	0	0	0	None	None	8.6E-04	2.0E-03	None	None	8.6E-05
Benzo(a)anthracene	Y	0	0	0	0	0	0	0	None	None	3.8E-02	1.8E-01	None	None	3.8E-03
Benzo(a)pyrene	Y	0	0	0	0	0	0	0	None	None	3.8E-02	1.8E-01	None	None	3.8E-03
Benzo(b)fluoranthene	Y	0	0	0	0	0	0	0	None	None	3.8E-02	1.8E-01	None	None	3.8E-03
Benzo(k)fluoranthene	Y	0	0	0	0	0	0	0	None	None	3.8E-02	1.8E-01	None	None	3.8E-03
Bis2-Chloroethyl Ether	Y	0	0	0	0	0	0	0	None	None	3.0E-01	5.3E+00	None	None	3.0E-02
Bis2-Chloroisopropyl Ether	N	0	0	0	0	0	0	0	None	None	1.4E+03	6.5E+04	None	None	1.4E+02
Bis2-Ethylehexyl Phthalate	Y	0	0	0	0	0	0	0	None	None	1.2E+01	2.2E+01	None	None	1.2E+00
Bromoform	Y	0	0	0	0	0	0	0	None	None	4.3E+01	1.4E+03	None	None	4.3E+00
Butyl Benzyl Phthalate	N	0	0	0	0	0	0	0	None	None	1.5E+03	1.9E+03	None	None	1.5E+02
Cadmium	N	0	0	0	0	0	0	0	2.9E+00	9.1E-01	5.0E+00	None	7.2E-01	2.3E-01	5.0E-01
Carbon Tetrachloride	Y	0	0	0	0	0	0	0	None	None	2.3E+00	1.6E+01	None	None	2.3E-01
Chlordane	Y	0	0	0	0	0	0	0	2.4E+00	4.3E-03	8.0E-03	8.1E-03	6.0E-01	1.1E-03	8.0E-04
Chloride	N	0	0	0	0	0	0	0	8.6E+02 mg/L	2.3E+02 mg/L	2.5E+02 mg/L	None	2.2E+02 mg/L	5.8E+01 mg/L	2.5E+01
Chlorine, Total Residual	N	0	0	0	0	0	0	0	1.9E-02 mg/L	1.1E-02 mg/L	None	None	4.8E-03 mg/L	2.8E-03 mg/L	None
Chlorobenzene	N	0	0	0	0	0	0	0	None	None	1.3E+02	1.6E+03	None	None	1.3E+01
Chlorodibromomethane	Y	0	0	0	0	0	0	0	None	None	4.0E+00	1.3E+02	None	None	4.0E-01
Chloroform	N	0	0	0	0	0	0	0	None	None	3.4E+02	1.1E+04	None	None	3.4E+01
2-Chloronaphthalene	N	0	0	0	0	0	0	0	None	None	1.0E+03	1.6E+03	None	None	1.0E+02
2-Chlorophenol	N	0	0	0	0	0	0	0	None	None	8.1E+01	1.5E+02	None	None	8.1E+00
Chlorpyrifos	N	0	0	0	0	0	0	0	8.3E-02	4.1E-02	None	None	2.1E-02	1.0E-02	None
Chromium (+3)	N	0	0	0	0	0	0	0	4.6E+02	5.9E+01	None	None	1.1E+02	1.5E+01	None
Chromium (+6)	N	0	0	0	0	0	0	0	1.6E+01	1.1E+01	None	None	4.0E+00	2.8E+00	None
Total Chromium	N	0	0	0	0	0	0	0	None	None	1.0E+02	None	None	None	1.0E+01
Chrysene	Y	0	0	0	0	0	0	0	None	None	3.8E-03	1.8E-02	None	None	3.8E-04
Copper	N	19.4673	13.31	9.64842	0.645	0.645	0.645	#REF!	1.0E+01	7.1E+00	1.3E+03	None	3.1E+00	2.3E+00	#REF!
Cyanide, Free	N	0	0	0	0	0	0	0	2.2E+01	5.2E+00	1.4E+02	1.6E+04	5.5E+00	1.3E+00	1.4E+01
DDD	Y	0	0	0	0	0	0	0	None	None	3.1E-03	3.1E-03	None	None	3.1E-04
DDE	Y	0	0	0	0	0	0	0	None	None	2.2E-03	2.2E-03	None	None	2.2E-04
DDT	Y	0	0	0	0	0	0	0	1.1E+00	1.0E-03	2.2E-03	2.2E-03	2.8E-01	2.5E-04	2.2E-04
Demeton	N	0	0	0	0	0	0	0	None	1.0E-01	None	None	None	2.5E-02	None
Diazinon	N	0	0	0	0	0	0	0	1.7E-01	1.7E-01	None	None	4.3E-02	4.3E-02	None
Dibenz(a,h)anthracene	Y	0	0	0	0	0	0	0	None	None	3.8E-02	1.8E-01	None	None	3.8E-03
1,2-Dichlorobenzene	N	0	0	0	0	0	0	0	None	None	4.2E+02	1.3E+03	None	None	4.2E+01
1,3-Dichlorobenzene	N	0	0	0	0	0	0	0	None	None	3.2E+02	9.6E+02	None	None	3.2E+01
1,4-Dichlorobenzene	N	0	0	0	0	0	0	0	None	None	6.3E+01	1.9E+02	None	None	6.3E+00
3,3-Dichlorobenzidine	Y	0	0	0	0	0	0	0	None	None	2.1E-01	2.8E-01	None	None	2.1E-02
Dichlorobromomethane	Y	0	0	0	0	0	0	0	None	None	5.5E+00	1.7E+02	None	None	5.5E-01
1,2-Dichloroethane	Y	0	0	0	0	0	0	0	None	None	3.8E+00	3.7E+02	None	None	3.8E-01
1,1-Dichloroethylene	N	0	0	0	0	0	0	0	None	None	3.3E+02	7.1E+03	None	None	3.3E+01
1,2-trans-dichloroethylene	N	0	0	0	0	0	0	0	None	None	1.4E+02	1.0E+04	None	None	1.4E+01
2,4-Dichlorophenol	N	0	0	0	0	0	0	0	None	None	7.7E+01	2.9E+02	None	None	7.7E+00
2,4-Dichlorophenoxy Acetic Acid	N	0	0	0	0	0	0	0	None	None	1.0E+02	None	None	None	1.0E+01
1,2-Dichloropropane	Y	0	0	0	0	0	0	0	None	None	5.0E+00	1.5E+02	None	None	5.0E-01
1,3-Dichloropropene	Y	0	0	0	0	0	0	0	None	None	3.4E+00	2.1E+02	None	None	3.4E-01
Dieldrin	Y	0	0	0	0	0	0	0	2.4E-01	5.6E-02	5.2E-04	5.4E-04	6.0E-02	1.4E-02	5.2E-05
Diethyl Phthalate	N	0	0	0	0	0	0	0	None	None	1.7E+04	4.4E+04	None	None	1.7E+03
2,4 Dimethylphenol	N	0	0	0	0	0	0	0	None	None	3.8E+02	8.5E+02	None	None	3.8E+01
Dimethyl Phthalate	N	0	0	0	0	0	0	0	None	None	2.7E+05	1.1E+06	None	None	2.7E+04
Di-n-Butyl Phthalate	N	0	0	0	0	0	0	0	None	None	2.0E+03	4.5E+03	None	None	2.0E+02
2,4 Dinitrophenol	N	0	0	0	0	0	0	0	None	None	6.9E+01	5.3E+03	None	None	6.9E+00
2-Methyl-4,6-Dinitrophenol	N	0	0	0	0	0	0	0	None	None	1.3E+01	2.8E+02	None	None	1.3E+00
2,4-Dinitrotoluene	Y	0	0	0	0	0	0	0	None	None	1.1E+00	3.4E+01	None	None	1.1E-01
Dioxin +	N	0	0	0	0	0	0	0	None	None	5.0E-08	5.1E-08	None	None	5.0E-09
1,2-Diphenylhydrazine	Y	0	0	0	0	0	0	0	None	None	3.6E-01	2.0E+00	None	None	3.6E-02
Alpha-Endosulfan	N	0	0	0	0	0	0	0	2.2E-01	5.6E-02	6.2E+01	8.9E+01	5.5E-02	1.4E-02	6.2E+00
Beta-Endosulfan	N	0	0	0	0	0	0	0	2.2E-01	5.6E-02	6.2E+01	8.9E+01	5.5E-02	1.4E-02	6.2E+00
Alpha+Beta-Endosulfan	N	0	0	0	0	0	0	0	2.2E-01	5.6E-02	None	None	5.5E-02	1.4E-02	None
Endosulfan Sulfate	N	0	0	0	0	0	0	0	None	None	6.2E+01	8.9E+01	None	None	6.2E+00

Facility Name:	Permit No.:
Christiansburg Wastewater Treatment Facility	VA0061751
Receiving Stream:	Date:
New River	6/9/2010

PRE - DISCHARGE WATER QUALITY CRITERIA

0.000 MGD Discharge Flow - 100% Stream Mix

Toxic Parameter and Form	Carcinogen?	97th Percentiles of Effluent Concentrations			Expected Value	Current Downstream Mix Concentrations			Aquatic Protection		Human Health		INSTREAM BASELINES		
		Daily	4-Day	30-Day	of Upstream Data	Acute	Chronic	H-Health	Acute	Chronic	Public Water Supplies	Other Surface Waters	Acute	Chronic	H-Health
Endrin	N	0	0	0	0	0	0	0	8.6E-02	3.6E-02	5.9E-02	6.0E-02	2.2E-02	9.0E-03	5.9E-03
Endrin Aldehyde	N	0	0	0	0	0	0	0	None	None	2.9E-01	3.0E-01	None	None	2.9E-02
Ethylbenzene	N	0	0	0	0	0	0	0	None	None	5.3E+02	2.1E+03	None	None	5.3E+01
Fluoranthene	N	0	0	0	0	0	0	0	None	None	1.3E+02	1.4E+02	None	None	1.3E+01
Fluorene	N	0	0	0	0	0	0	0	None	None	1.1E+03	5.3E+03	None	None	1.1E+02
Foaming Agents (MBAS)	N	0	0	0	0	0	0	0	None	None	5.0E+02	None	None	None	5.0E+01
Guthion	N	0	0	0	0	0	0	0	None	1.0E-02	None	None	None	2.5E-03	None
Heptachlor	Y	0	0	0	0	0	0	0	5.2E-01	3.8E-03	7.9E-04	7.9E-04	1.3E-01	9.5E-04	7.9E-05
Heptachlor Epoxide	Y	0	0	0	0	0	0	0	5.2E-01	3.8E-03	3.9E-04	3.9E-04	1.3E-01	9.5E-04	3.9E-05
Hexachlorobenzene	Y	0	0	0	0	0	0	0	None	None	2.8E-03	2.9E-03	None	None	2.8E-04
Hexachlorobutadiene	Y	0	0	0	0	0	0	0	None	None	4.4E+00	1.8E+02	None	None	4.4E-01
Hexachlorocyclohexane Alpha-BH	Y	0	0	0	0	0	0	0	None	None	2.6E-02	4.9E-02	None	None	2.6E-03
Hexachlorocyclohexane Beta-BHC	Y	0	0	0	0	0	0	0	None	None	9.1E-02	1.7E-01	None	None	9.1E-03
Hexachlorocyclohexane Gamma-BHC (Lindane)	Y	0	0	0	0	0	0	0	9.5E-01	None	9.8E-01	1.8E+00	2.4E-01	None	9.8E-02
Hexachlorocyclopentadiene	N	0	0	0	0	0	0	0	None	None	4.0E+01	1.1E+03	None	None	4.0E+00
Hexachloroethane	Y	0	0	0	0	0	0	0	None	None	1.4E+01	3.3E+01	None	None	1.4E+00
Hydrogen Sulfide	N	0	0	0	0	0	0	0	None	2.0E+00	None	None	None	5.0E-01	None
Indeno(1,2,3-cd)pyrene	Y	0	0	0	0	0	0	0	None	None	3.8E-02	1.8E-01	None	None	3.8E-03
Iron	N	0	0	0	0	0	0	0	None	None	3.0E+02	None	None	None	3.0E+01
Isophorone	Y	0	0	0	0	0	0	0	None	None	3.5E+02	9.6E+03	None	None	3.5E+01
Kepone	N	0	0	0	0	0	0	0	None	Zero	None	None	None	Zero	None
Lead	N	0	0	0	0	0	0	0	8.4E+01	9.5E+00	1.5E+01	None	2.1E+01	2.4E+00	1.5E+00
Malathion	N	0	0	0	0	0	0	0	None	1.0E-01	None	None	None	2.5E-02	None
Manganese	N	0	0	0	0	0	0	0	None	None	5.0E+01	None	None	None	5.0E+00
Mercury	N	0	0	0	0	0	0	0	1.4E+00	7.7E-01	None	None	3.5E-01	1.9E-01	None
Methyl Bromide	N	0	0	0	0	0	0	0	None	None	4.7E+01	1.5E+03	None	None	4.7E+00
Methylene Chloride	Y	0	0	0	0	0	0	0	None	None	4.6E+01	5.9E+03	None	None	4.6E+00
Methoxychlor	N	0	0	0	0	0	0	0	None	3.0E-02	1.0E+02	None	None	7.5E-03	1.0E+01
Mirex	N	0	0	0	0	0	0	0	None	Zero	None	None	None	Zero	None
Nickel	N	0	0	0	0	0	0	0	1.4E+02	1.6E+01	6.1E+02	4.6E+03	3.6E+01	4.0E+00	6.1E+01
Nitrate (as N)	N	0	0	0	0	0	0	0	None	None	1.0E+01 mg/L	None	None	None	1.0E+00
Nitrobenzene	N	0	0	0	0	0	0	0	None	None	1.7E+01	6.9E+02	None	None	1.7E+00
N-Nitrosodimethylamine	Y	0	0	0	0	0	0	0	None	None	6.9E-03	3.0E+01	None	None	6.9E-04
N-Nitrosodiphenylamine	Y	0	0	0	0	0	0	0	None	None	3.3E+01	6.0E+01	None	None	3.3E+00
N-Nitrosodi-n-propylamine	Y	0	0	0	0	0	0	0	None	None	5.0E-02	5.1E+00	None	None	5.0E-03
Nonylphenol	N	0	0	0	0	0	0	0	2.8E+01	6.6E+00	None	None	7.0E+00	1.7E+00	None
Parathion	N	0	0	0	0	0	0	0	6.5E-02	1.3E-02	None	None	1.6E-02	3.3E-03	None
PCB Total	Y	0	0	0	0	0	0	0	None	1.4E-02	6.4E-04	6.4E-04	None	3.5E-03	6.4E-05
Pentachlorophenol	Y	0	0	0	0	0	0	0	1.2E+01	9.0E+00	2.7E+00	3.0E+01	2.9E+00	2.3E+00	2.7E-01
Phenol	N	0	0	0	0	0	0	0	None	None	1.0E+04	8.6E+05	None	None	1.0E+03
Pyrene	N	0	0	0	0	0	0	0	None	None	8.3E+02	4.0E+03	None	None	8.3E+01
RadNuc - Beta Part & Photon Act	N	0	0	0	0	0	0	0	None	None	4.0E+00 mrem	None	None	None	4.0E-01
RadNuc - Gross Alpha Part Act	N	0	0	0	0	0	0	0	None	None	1.5E+01 pCi/L	None	None	None	1.5E+00
RadNuc - Radium 226 + 228	N	0	0	0	0	0	0	0	None	None	5.0E+00 pCi/L	None	None	None	5.0E-01
RadNuc - Uranium	N	0	0	0	0	0	0	0	None	None	3.0E+01	None	None	None	3.0E+00
Selenium, Total Recoverable	N	0	0	0	0	0	0	0	2.0E+01	5.0E+00	1.7E+02	4.2E+03	5.0E+00	1.3E+00	1.7E+01
Silver	N	0	0	0	0	0	0	0	2.2E+00	None	None	None	5.4E-01	None	None
Sulfate	N	0	0	0	0	0	0	0	None	None	2.5E+02 mg/L	None	None	None	2.5E+01
1,1,2,2-Tetrachloroethane	Y	0	0	0	0	0	0	0	None	None	1.7E+00	4.0E+01	None	None	1.7E-01
Tetrachloroethylene	Y	0	0	0	0	0	0	0	None	None	6.9E+00	3.3E+01	None	None	6.9E-01
Thallium	N	0	0	0	0	0	0	0	None	None	2.4E-01	4.7E-01	None	None	2.4E-02
Toluene	N	0	0	0	0	0	0	0	None	None	5.1E+02	6.0E+03	None	None	5.1E+01
Total Dissolved Solids	N	0	0	0	0	0	0	0	None	None	5.0E+05	None	None	None	5.0E+04
Toxaphene	Y	0	0	0	0	0	0	0	7.3E-01	2.0E-04	2.8E-03	2.8E-03	1.8E-01	5.0E-05	2.8E-04
Tributyltin	N	0	0	0	0	0	0	0	4.6E-01	7.2E-02	None	None	1.2E-01	1.8E-02	None
1,2,4-Trichlorobenzene	N	0	0	0	0	0	0	0	None	None	3.5E+01	7.0E+01	None	None	3.5E+00
1,1,2-Trichloroethane	Y	0	0	0	0	0	0	0	None	None	5.9E+00	1.6E+02	None	None	5.9E-01
Trichloroethylene	Y	0	0	0	0	0	0	0	None	None	2.5E+01	3.0E+02	None	None	2.5E+00
2,4,6-Trichlorophenol	Y	0	0	0	0	0	0	0	None	None	1.4E+01	2.4E+01	None	None	1.4E+00
2-(2,4,5-Trichlorophenoxy propionic acid (Silvex)	N	0	0	0	0	0	0	0	None	None	5.0E+01	None	None	None	5.0E+00
Vinyl Chloride	Y	0	0	0	0	0	0	0	None	None	2.5E-01	2.4E+01	None	None	2.5E-02
Zinc	N	139.515	95.391	69.147	3.675	3.675	3.675	3.675	9.3E+01	9.4E+01	7.4E+03	2.6E+04	2.6E+01	2.6E+01	7.4E+02

Facility Name:
Christiansburg Wastewater Treatment Facility
Receiving Stream:
New River

Toxic Parameter and Form	ANTIDEGRADATION WASTE LOAD ALLOCATIONS (8.000 MGD Discharge - 100% Stream Mix)			POST - DISCHARGE WATER QUALITY CRITERIA (8.000 MGD Discharge Flow - Mix per "Mixer")				NON-ANTIDEGRADATION WASTE LOAD ALLOCATIONS (8.000 MGD Discharge - Mix per "Mixer")			MOST RESTRICTIVE WASTE LOAD ALLOCATIONS (8.000 MGD Discharge Flow)			
	Aquatic Protection		Human Health	Aquatic Protection		Human Health		Aquatic Protection		Human Health	Aquatic Protection		Human Health	Target Level
	Acute	Chronic		Acute	Chronic	Public Water Supplies	Other Surface Waters	Acute	Chronic		Acute	Chronic		
Acenaphthene	N/A	N/A	6.3E+03	None	None	6.7E+02	9.9E+02	N/A	N/A	6.3E+04	N/A	N/A	6.3E+03	N/A
Acrolein	N/A	N/A	5.7E+01	None	None	6.1E+00	9.3E+00	N/A	N/A	5.7E+02	N/A	N/A	5.7E+01	N/A
Acrylonitrile	N/A	N/A	9.8E+00	None	None	5.1E-01	2.5E+00	N/A	N/A	9.8E+01	N/A	N/A	9.8E+00	N/A
Aldrin	4.5E+01	N/A	9.4E-03	3.0E+00	None	4.9E-04	5.0E-04	1.8E+02	N/A	9.4E-02	4.5E+01	N/A	9.4E-03	N/A
Ammonia-N (Annual)	8.4E+01 mg/L	2.1E+01 mg/L	N/A	6.2E+00 mg/L	1.1E+00 mg/L	None	None	3.6E+02 mg/L	8.7E+01 mg/L	N/A	8.4E+01 mg/L	2.1E+01 mg/L	N/A	N/A
Ammonia-N (Wet Season)	9.9E+01 mg/L	6.0E+01 mg/L	N/A	6.1E+00 mg/L	1.8E+00 mg/L	None	None	4.2E+02 mg/L	2.5E+02 mg/L	N/A	9.9E+01 mg/L	6.0E+01 mg/L	N/A	N/A
Anthracene	N/A	N/A	7.8E+04	None	None	8.3E+03	4.0E+04	N/A	N/A	7.8E+05	N/A	N/A	7.8E+04	N/A
Antimony	N/A	N/A	5.2E+01	None	None	5.6E+00	6.4E+02	N/A	N/A	5.2E+02	N/A	N/A	5.2E+01	5.2E+01
Arsenic	5.0E+03	2.7E+03	9.4E+01	3.4E+02	1.5E+02	1.0E+01	None	2.0E+04	1.1E+04	9.4E+02	5.0E+03	2.7E+03	9.4E+01	9.4E+01
Barium	N/A	N/A	1.9E+04	None	None	2.0E+03	None	N/A	N/A	1.9E+05	N/A	N/A	1.9E+04	1.9E+04
Benzene	N/A	N/A	4.2E+02	None	None	2.2E+01	5.1E+02	N/A	N/A	4.2E+03	N/A	N/A	4.2E+02	N/A
Benzidine	N/A	N/A	1.7E-02	None	None	8.6E-04	2.0E-03	N/A	N/A	1.7E-01	N/A	N/A	1.7E-02	N/A
Benzo(a)anthracene	N/A	N/A	7.3E-01	None	None	3.8E-02	1.8E-01	N/A	N/A	7.3E+00	N/A	N/A	7.3E-01	N/A
Benzo(a)pyrene	N/A	N/A	7.3E-01	None	None	3.8E-02	1.8E-01	N/A	N/A	7.3E+00	N/A	N/A	7.3E-01	N/A
Benzo(b)fluoranthene	N/A	N/A	7.3E-01	None	None	3.8E-02	1.8E-01	N/A	N/A	7.3E+00	N/A	N/A	7.3E-01	N/A
Benzo(k)fluoranthene	N/A	N/A	7.3E-01	None	None	3.8E-02	1.8E-01	N/A	N/A	7.3E+00	N/A	N/A	7.3E-01	N/A
Bis2-Chloroethyl Ether	N/A	N/A	5.8E+00	None	None	3.0E-01	5.3E+00	N/A	N/A	5.8E+01	N/A	N/A	5.8E+00	N/A
Bis2-Chloroisopropyl Ether	N/A	N/A	1.3E+04	None	None	1.4E+03	6.5E+04	N/A	N/A	1.3E+05	N/A	N/A	1.3E+04	N/A
Bis2-Ethylehexyl Phthalate	N/A	N/A	2.3E+02	None	None	1.2E+01	2.2E+01	N/A	N/A	2.3E+03	N/A	N/A	2.3E+02	N/A
Bromoform	N/A	N/A	8.3E+02	None	None	4.3E+01	1.4E+03	N/A	N/A	8.3E+03	N/A	N/A	8.3E+02	N/A
Butyl Benzyl Phthalate	N/A	N/A	1.4E+04	None	None	1.5E+03	1.9E+03	N/A	N/A	1.4E+05	N/A	N/A	1.4E+04	N/A
Cadmium	4.3E+01	1.7E+01	4.7E+01	2.9E+00	9.3E-01	5.0E+00	None	1.8E+02	6.8E+01	4.7E+02	4.3E+01	1.7E+01	4.7E+01	1.0E+01
Carbon Tetrachloride	N/A	N/A	4.4E+01	None	None	2.3E+00	1.6E+01	N/A	N/A	4.4E+02	N/A	N/A	4.4E+01	N/A
Chlordane	3.6E+01	7.9E-02	1.5E-01	2.4E+00	4.3E-03	8.0E-03	8.1E-03	1.4E+02	3.1E-01	1.5E+00	3.6E+01	7.9E-02	1.5E-01	N/A
Chloride mg/L	1.3E+04 mg/L	4.2E+03 mg/L	2.3E+03 mg/L	8.6E+02 mg/L	2.3E+02 mg/L	2.5E+02 mg/L	None	5.1E+04 mg/L	1.7E+04 mg/L	2.3E+04 mg/L	1.3E+04 mg/L	4.2E+03 mg/L	2.3E+03 mg/L	N/A
Chlorine, Total Residual	2.8E-01 mg/L	2.0E-01 mg/L	N/A	1.9E-02 mg/L	1.1E-02 mg/L	None	None	1.1E+00 mg/L	8.0E-01 mg/L	N/A	2.8E-01 mg/L	2.0E-01 mg/L	N/A	N/A
Chlorobenzene	N/A	N/A	1.2E+03	None	None	1.3E+02	1.6E+03	N/A	N/A	1.2E+04	N/A	N/A	1.2E+03	N/A
Chlorodibromomethane	N/A	N/A	7.7E+01	None	None	4.0E+00	1.3E+02	N/A	N/A	7.7E+02	N/A	N/A	7.7E+01	N/A
Chloroform	N/A	N/A	3.2E+03	None	None	3.4E+02	1.1E+04	N/A	N/A	3.2E+04	N/A	N/A	3.2E+03	N/A
2-Chloronaphthalene	N/A	N/A	9.4E+03	None	None	1.0E+03	1.6E+03	N/A	N/A	9.4E+04	N/A	N/A	9.4E+03	N/A
2-Chlorophenol	N/A	N/A	7.6E+02	None	None	8.1E+01	1.5E+02	N/A	N/A	7.6E+03	N/A	N/A	7.6E+02	N/A
Chlorpyrifos	1.2E+00	7.5E-01	N/A	8.3E-02	4.1E-02	None	None	4.9E+00	3.0E+00	N/A	1.2E+00	7.5E-01	N/A	N/A
Chromium (+3)	6.8E+03	1.1E+03	N/A	4.6E+02	6.0E+01	None	None	2.8E+04	4.4E+03	N/A	6.8E+03	1.1E+03	N/A	6.5E+02
Chromium (+6)	2.4E+02	2.0E+02	N/A	1.6E+01	1.1E+01	None	None	9.5E+02	8.0E+02	N/A	2.4E+02	2.0E+02	N/A	9.5E+01
Total Chromium	N/A	N/A	9.4E+02	None	None	1.0E+02	None	N/A	N/A	9.4E+03	N/A	N/A	9.4E+02	9.4E+02
Chrysene	N/A	N/A	7.3E-02	None	None	4.4E-02	4.9E-01	N/A	N/A	8.4E+00	N/A	N/A	7.3E-02	N/A
Copper	1.5E+02	1.2E+02	#REF!	1.1E+01	7.2E+00	1.3E+03	None	5.9E+02	4.8E+02	1.2E+05	1.5E+02	1.2E+02	#REF!	#REF!
Cyanide, Free	3.3E+02	9.5E+01	1.3E+03	2.2E+01	5.2E+00	1.4E+02	1.6E+04	1.3E+03	3.8E+02	1.3E+04	3.3E+02	9.5E+01	1.3E+03	N/A
DDD	N/A	N/A	5.9E-02	None	None	3.1E-03	3.1E-03	N/A	N/A	5.9E-01	N/A	N/A	5.9E-02	N/A
DDE	N/A	N/A	4.2E-02	None	None	2.2E-03	2.2E-03	N/A	N/A	4.2E-01	N/A	N/A	4.2E-02	N/A
DDT	1.6E+01	1.8E-02	4.2E-02	1.1E+00	1.0E-03	2.2E-03	2.2E-03	6.5E+01	7.3E-02	4.2E-01	1.6E+01	1.8E-02	4.2E-02	N/A
Demeton	N/A	1.8E+00	N/A	None	1.0E-01	None	None	N/A	7.3E+00	N/A	N/A	1.8E+00	N/A	N/A
Diazinon	2.5E+00	3.1E+00	N/A	1.7E-01	1.7E-01	None	None	1.0E+01	1.2E+01	N/A	2.5E+00	3.1E+00	N/A	N/A
Dibenz(a,h)anthracene	N/A	N/A	7.3E-01	None	None	3.8E-02	1.8E-01	N/A	N/A	7.3E+00	N/A	N/A	7.3E-01	N/A
1,2-Dichlorobenzene	N/A	N/A	3.9E+03	None	None	4.2E+02	1.3E+03	N/A	N/A	3.9E+04	N/A	N/A	3.9E+03	N/A
1,3-Dichlorobenzene	N/A	N/A	3.0E+03	None	None	3.2E+02	9.6E+02	N/A	N/A	3.0E+04	N/A	N/A	3.0E+03	N/A
1,4-Dichlorobenzene	N/A	N/A	5.9E+02	None	None	6.3E+01	1.9E+02	N/A	N/A	5.9E+03	N/A	N/A	5.9E+02	N/A
3,3-Dichlorobenzidine	N/A	N/A	4.0E+00	None	None	2.1E-01	2.8E-01	N/A	N/A	4.0E+01	N/A	N/A	4.0E+00	N/A
Dichlorobromomethane	N/A	N/A	1.1E+02	None	None	5.5E+00	1.7E+02	N/A	N/A	1.1E+03	N/A	N/A	1.1E+02	N/A
1,2-Dichloroethane	N/A	N/A	7.3E+01	None	None	3.8E+00	3.7E+02	N/A	N/A	7.3E+02	N/A	N/A	7.3E+01	N/A
1,1-Dichloroethylene	N/A	N/A	3.1E+03	None	None	3.3E+02	7.1E+03	N/A	N/A	3.1E+04	N/A	N/A	3.1E+03	N/A
1,2-trans-dichloroethylene	N/A	N/A	1.3E+03	None	None	1.4E+02	1.0E+04	N/A	N/A	1.3E+04	N/A	N/A	1.3E+03	N/A
2,4-Dichlorophenol	N/A	N/A	7.2E+02	None	None	7.7E+01	2.9E+02	N/A	N/A	7.2E+03	N/A	N/A	7.2E+02	N/A
2,4-Dichlorophenoxy Acetic Acid	N/A	N/A	9.4E+02	None	None	1.0E+02	None	N/A	N/A	9.4E+03	N/A	N/A	9.4E+02	N/A
1,2-Dichloropropane	N/A	N/A	9.6E+01	None	None	5.0E+00	1.5E+02	N/A	N/A	9.6E+02	N/A	N/A	9.6E+01	N/A
1,3-Dichloropropene	N/A	N/A	6.5E+01	None	None	3.4E+00	2.1E+02	N/A	N/A	6.5E+02	N/A	N/A	6.5E+01	N/A
Dieldrin	3.6E+00	1.0E+00	1.0E-02	2.4E-01	5.6E-02	5.2E-04	5.4E-04	1.4E+01	4.1E+00	1.0E-01	3.6E+00	1.0E+00	1.0E-02	N/A
Diethyl Phthalate	N/A	N/A	1.6E+05	None	None	1.7E+04	4.4E+04	N/A	N/A	1.6E+06	N/A	N/A	1.6E+05	N/A
2,4 Dimethylphenol	N/A	N/A	3.6E+03	None	None	3.8E+02	8.5E+02	N/A	N/A	3.6E+04	N/A	N/A	3.6E+03	N/A
Dimethyl Phthalate	N/A	N/A	2.5E+06	None	None	2.7E+05	1.1E+06	N/A	N/A	2.5E+07	N/A	N/A	2.5E+06	N/A
Di-n-Butyl Phthalate	N/A	N/A	1.9E+04	None	None	2.0E+03	4.5E+03	N/A	N/A	1.9E+05	N/A	N/A	1.9E+04	N/A
2,4 Dinitrophenol	N/A	N/A	6.5E+02	None	None	6.9E+01	5.3E+03	N/A	N/A	6.5E+03	N/A	N/A	6.5E+02	N/A
2-Methyl-4,6-Dinitrophenol	N/A	N/A	1.2E+02	None	None	1.3E+01	2.8E+02	N/A	N/A	1.2E+03	N/A	N/A	1.2E+02	N/A
2,4-Dinitrotoluene	N/A	N/A	2.1E+01	None	None	1.1E+00	3.4E+01	N/A	N/A	2.1E+02	N/A	N/A	2.1E+01	N/A
Dioxin +	N/A	N/A	4.7E-07	None	None	5.0E-08	5.1E-08	N/A	N/A	4.7E-06	N/A	N/A	4.7E-07	N/A
1,2-Diphenylhydrazine	N/A	N/A	6.9E+00	None	None	3.6E-01	2.0E+00	N/A	N/A	6.9E+01	N/A	N/A	6.9E+00	N/A
Alpha-Endosulfan	3.3E+00	1.0E+00	5.8E+02	2.2E-01	5.6E-02	6.2E+01	8.9E+01	1.3E+01	4.1E+00	5.8E+03	3.3E+00	1.0E+00	5.8E+02	N/A
Beta-Endosulfan	3.3E+00	1.0E+00	5.8E+02	2.2E-01	5.6E-02	6.2E+01	8.9E+01	1.3E+01	4.1E+00	5.8E+03	3.3E+00	1.0E+00	5.8E+02	N/A
Alpha+Beta-Endosulfan	3.3E+00	1.0E+00	N/A	2.2E-01	5.6E-02	None	None	1.3E+01	4.1E+00	N/A	3.3E+00	1.0E+00	N/A	N/A
Endosulfan Sulfate	N/A	N/A	5.8E+02	None	None	6.2E+01	8.9E+01	N/A	N/A	5.8E+03	N/A	N/A	5.8E+02	N/A

Facility Name:
Christiansburg Wastewater Treatment Facility
Receiving Stream:
New River

Toxic Parameter and Form		ANTIDEGRADATION WASTE LOAD ALLOCATIONS (8.000 MGD Discharge - 100% Stream Mix)			POST - DISCHARGE WATER QUALITY CRITERIA (8.000 MGD Discharge Flow - Mix per "Mixer")				NON-ANTIDEGRADATION WASTE LOAD ALLOCATIONS (8.000 MGD Discharge - Mix per "Mixer")			MOST RESTRICTIVE WASTE LOAD ALLOCATIONS (8.000 MGD Discharge Flow)			Target
		Aquatic Protection		Human Health	Aquatic Protection		Human Health		Aquatic Protection		Human Health	Aquatic Protection		Human Health	Level
		Acute	Chronic		Acute	Chronic	Public Water Supplies	Other Surface Waters	Acute	Chronic		Acute	Chronic		
Endrin		1.3E+00	6.6E-01	5.5E-01	8.6E-02	3.6E-02	5.9E-02	6.0E-02	5.1E+00	2.6E+00	5.5E+00	1.3E+00	6.6E-01	5.5E-01	N/A
Endrin Aldehyde		N/A	N/A	2.7E+00	None	None	2.9E-01	3.0E-01	N/A	N/A	2.7E+01	N/A	N/A	2.7E+00	N/A
Ethylbenzene		N/A	N/A	5.0E+03	None	None	5.3E+02	2.1E+03	N/A	N/A	5.0E+04	N/A	N/A	5.0E+03	N/A
Fluoranthene		N/A	N/A	1.2E+03	None	None	1.3E+02	1.4E+02	N/A	N/A	1.2E+04	N/A	N/A	1.2E+03	N/A
Fluorene		N/A	N/A	1.0E+04	None	None	1.1E+03	5.3E+03	N/A	N/A	1.0E+05	N/A	N/A	1.0E+04	N/A
Foaming Agents (MBAS)		N/A	N/A	4.7E+03	None	None	5.0E+02	None	N/A	N/A	4.7E+04	N/A	N/A	4.7E+03	N/A
Guthion		N/A	1.6E-01	N/A	None	1.0E-02	None	None	N/A	7.3E-01	N/A	N/A	1.6E-01	N/A	N/A
Heptachlor		7.7E+00	6.9E-02	1.5E-02	5.2E-01	3.8E-03	7.9E-04	7.9E-04	3.1E+01	2.8E-01	1.5E-01	7.7E+00	6.9E-02	1.5E-02	N/A
Heptachlor Epoxide		7.7E+00	6.9E-02	7.5E-03	5.2E-01	3.8E-03	3.9E-04	3.9E-04	3.1E+01	2.8E-01	7.5E-02	7.7E+00	6.9E-02	7.5E-03	N/A
Hexachlorobenzene		N/A	N/A	5.4E-02	None	None	2.8E-03	2.9E-03	N/A	N/A	5.4E-01	N/A	N/A	5.4E-02	N/A
Hexachlorobutadiene		N/A	N/A	8.4E+01	None	None	4.4E+00	1.8E+02	N/A	N/A	8.4E+02	N/A	N/A	8.4E+01	N/A
Hexachlorocyclohexane Alpha-BH(		N/A	N/A	5.0E-01	None	None	2.6E-02	4.9E-02	N/A	N/A	5.0E+00	N/A	N/A	5.0E-01	N/A
Hexachlorocyclohexane Beta-BHC		N/A	N/A	1.7E+00	None	None	9.1E-02	1.7E-01	N/A	N/A	1.7E+01	N/A	N/A	1.7E+00	N/A
Hexachlorocyclohexane Gamma-BHC (Lindane)		1.4E+01	N/A	1.9E+01	9.5E-01	None	9.8E-01	1.8E+00	5.6E+01	N/A	1.9E+02	1.4E+01	N/A	1.9E+01	N/A
Hexachlorocyclopentadiene		N/A	N/A	3.7E+02	None	None	4.0E+01	1.1E+03	N/A	N/A	3.7E+03	N/A	N/A	3.7E+02	N/A
Hexachloroethane		N/A	N/A	2.7E+02	None	None	1.4E+01	3.3E+01	N/A	N/A	2.7E+03	N/A	N/A	2.7E+02	N/A
Hydrogen Sulfide		N/A	3.7E+01	N/A	None	2.0E+00	None	None	N/A	1.5E+02	N/A	N/A	3.7E+01	N/A	N/A
Indeno(1,2,3-cd)pyrene		N/A	N/A	7.3E-01	None	None	3.8E-02	1.8E-01	N/A	N/A	7.3E+00	N/A	N/A	7.3E-01	N/A
Iron		N/A	N/A	2.8E+03	None	None	3.0E+02	None	N/A	N/A	2.8E+04	N/A	N/A	2.8E+03	2.8E+03
Isophorone		N/A	N/A	6.7E+03	None	None	3.5E+02	9.6E+03	N/A	N/A	6.7E+04	N/A	N/A	6.7E+03	N/A
Kepone		N/A	Zero	N/A	None	Zero	None	None	N/A	Zero	N/A	N/A	Zero	N/A	N/A
Lead		1.2E+03	1.7E+02	1.4E+02	8.6E+01	9.7E+00	1.5E+01	None	5.1E+03	7.1E+02	1.4E+03	1.2E+03	1.7E+02	1.4E+02	1.0E+02
Malathion		N/A	1.8E+00	N/A	None	1.0E-01	None	None	N/A	7.3E+00	N/A	N/A	1.8E+00	N/A	N/A
Manganese		N/A	N/A	4.7E+02	None	None	5.0E+01	None	N/A	N/A	4.7E+03	N/A	N/A	4.7E+02	4.7E+02
Mercury		2.1E+01	1.4E+01	N/A	1.4E+00	7.7E-01	None	None	8.3E+01	5.6E+01	N/A	2.1E+01	1.4E+01	N/A	8.3E+00
Methyl Bromide		N/A	N/A	4.4E+02	None	None	4.7E+01	1.5E+03	N/A	N/A	4.4E+03	N/A	N/A	4.4E+02	N/A
Methylene Chloride		N/A	N/A	8.8E+02	None	None	4.6E+01	5.9E+03	N/A	N/A	8.8E+03	N/A	N/A	8.8E+02	N/A
Methoxychlor		N/A	5.5E-01	9.4E+02	None	3.0E-02	1.0E+02	None	N/A	2.2E+00	9.4E+03	N/A	5.5E-01	9.4E+02	N/A
Mirex		N/A	Zero	N/A	None	Zero	None	None	N/A	Zero	N/A	N/A	Zero	N/A	N/A
Nickel		2.1E+03	2.9E+02	5.7E+03	1.5E+02	1.6E+01	6.1E+02	4.6E+03	8.7E+03	1.2E+03	5.7E+04	2.1E+03	2.9E+02	5.7E+03	1.8E+02
Nitrate (as N)	mg/L	N/A	N/A	9.4E+01 mg/L	None	None	1.0E+01 mg/L	None	N/A	N/A	9.4E+02 mg/L	N/A	N/A	9.4E+01 mg/L	N/A
Nitrobenzene		N/A	N/A	1.6E+02	None	None	1.7E+01	6.9E+02	N/A	N/A	1.6E+03	N/A	N/A	1.6E+02	N/A
N-Nitrosodimethylamine		N/A	N/A	1.3E-01	None	None	6.9E-03	3.0E+01	N/A	N/A	1.3E+00	N/A	N/A	1.3E-01	N/A
N-Nitrosodiphenylamine		N/A	N/A	6.3E+02	None	None	3.3E+01	6.0E+01	N/A	N/A	6.3E+03	N/A	N/A	6.3E+02	N/A
N-Nitrosodi-n-propylamine		N/A	N/A	9.6E-01	None	None	5.0E-02	5.1E+00	N/A	N/A	9.6E+00	N/A	N/A	9.6E-01	N/A
Nonylphenol		4.2E+02	1.2E+02	N/A	2.8E+01	6.6E+00	None	None	1.7E+03	4.8E+02	N/A	4.2E+02	1.2E+02	N/A	N/A
Parathion		9.6E-01	2.4E-01	N/A	6.5E-02	1.3E-02	None	None	3.9E+00	9.5E-01	N/A	9.6E-01	2.4E-01	N/A	N/A
PCB Total		N/A	2.6E-01	1.2E-02	None	1.4E-02	6.4E-04	6.4E-04	N/A	1.0E+00	1.2E-01	N/A	2.6E-01	1.2E-02	N/A
Pentachlorophenol		1.8E+02	1.7E+02	5.2E+01	1.2E+01	8.9E+00	2.7E+00	3.0E+01	6.9E+02	6.5E+02	5.2E+02	1.8E+02	1.7E+02	5.2E+01	N/A
Phenol		N/A	N/A	9.4E+04	None	None	1.0E+04	8.6E+05	N/A	N/A	9.4E+05	N/A	N/A	9.4E+04	N/A
Pyrene		N/A	N/A	7.8E+03	None	None	8.3E+02	4.0E+03	N/A	N/A	7.8E+04	N/A	N/A	7.8E+03	N/A
RadNuc - Beta Part & Photon Act	mrem	N/A	N/A	3.7E+01 mrem	None	None	4.0E+00 mrem	4.0E+00 mre	N/A	N/A	3.7E+02 mrem	N/A	N/A	3.7E+01 mrem	N/A
RadNuc - Gross Alpha Part Act	pCi/L	N/A	N/A	1.4E+02 pCi/L	None	None	1.5E+01 pCi/L	None	N/A	N/A	1.4E+03 pCi/L	N/A	N/A	1.4E+02 pCi/L	N/A
RadNuc - Radium 226 + 228	pCi/L	N/A	N/A	4.7E+01 pCi/L	None	None	5.0E+00 pCi/L	None	N/A	N/A	4.7E+02 pCi/L	N/A	N/A	4.7E+01 pCi/L	N/A
RadNuc - Uranium		N/A	N/A	2.8E+02	None	None	3.0E+01	None	N/A	N/A	2.8E+03	N/A	N/A	2.8E+02	N/A
Selenium, Total Recoverable		3.0E+02	9.1E+01	1.6E+03	2.0E+01	5.0E+00	1.7E+02	4.2E+03	1.2E+03	3.7E+02	1.6E+04	3.0E+02	9.1E+01	1.6E+03	5.5E+01
Silver		3.2E+01	N/A	N/A	2.2E+00	None	None	None	1.3E+02	N/A	N/A	3.2E+01	N/A	N/A	1.3E+01
Sulfate	mg/L	N/A	N/A	2.3E+03 mg/L	None	None	2.5E+02 mg/L	None	N/A	N/A	2.3E+04 mg/L	N/A	N/A	2.3E+03 mg/L	N/A
1,1,2,2-Tetrachloroethane		N/A	N/A	3.3E+01	None	None	1.7E+00	4.0E+01	N/A	N/A	3.3E+02	N/A	N/A	3.3E+01	N/A
Tetrachloroethylene		N/A	N/A	1.3E+02		None	6.9E+00	3.3E+01	0.0E+00	N/A	1.3E+03	N/A	N/A	1.3E+02	N/A
Thallium		N/A	N/A	2.2E+00	None	None	2.4E-01	4.7E-01	N/A	N/A	2.2E+01	N/A	N/A	2.2E+00	N/A
Toluene		N/A	N/A	4.8E+03	None	None	5.1E+02	6.0E+03	N/A	N/A	4.8E+04	N/A	N/A	4.8E+03	N/A
Total Dissolved Solids		N/A	N/A	4.7E+06	None	None	5.0E+05	None	N/A	N/A	4.7E+07	N/A	N/A	4.7E+06	N/A
Toxaphene		1.1E+01	3.7E-03	5.4E-02	7.3E-01	2.0E-04	2.8E-03	2.8E-03	4.3E+01	1.5E-02	5.4E-01	1.1E+01	3.7E-03	5.4E-02	N/A
Tributyltin		6.8E+00	1.3E+00	N/A	4.6E-01	7.2E-02	None	None	2.7E+01	5.3E+00	N/A	6.8E+00	1.3E+00	N/A	N/A
1,2,4-Trichlorobenzene		N/A	N/A	3.3E+02	None	None	3.5E+01	7.0E+01	N/A	N/A	3.3E+03	N/A	N/A	3.3E+02	N/A
1,1,2-Trichloroethane		N/A	N/A	1.1E+02	None	None	5.9E+00	1.6E+02	N/A	N/A	1.1E+03	N/A	N/A	1.1E+02	N/A
Trichloroethylene		N/A	N/A	4.8E+02	None	None	2.5E+01	3.0E+02	N/A	N/A	4.8E+03	N/A	N/A	4.8E+02	N/A
2,4,6-Trichlorophenol		N/A	N/A	2.7E+02	None	None	1.4E+01	2.4E+01	N/A	N/A	2.7E+03	N/A	N/A	2.7E+02	N/A
2-(2,4,5-Trichlorophenoxy propionic acid (Silvex)		N/A	N/A	4.7E+02	None	None	5.0E+01	None	N/A	N/A	4.7E+03	N/A	N/A	4.7E+02	N/A
Vinyl Chloride		N/A	N/A	4.8E+00	None	None	2.5E-01	2.4E+01	N/A	N/A	4.8E+01	N/A	N/A	4.8E+00	N/A
Zinc		1.3E+03	1.6E+03	6.9E+04	9.5E+01	9.5E+01	7.4E+03	2.6E+04	5.4E+03	6.7E+03	6.9E+05	1.3E+03	1.6E+03	6.9E+04	5.3E+02

APPENDIX G

WATER QUALITY BASED LIMITATIONS ANALYSIS – STATS

6.0 MGD and 8.0 MGD discharge flows

Ammonia
annual
wet season

Copper

Zinc

5/6/2010 4:26:41 PM

Facility = Christiansburg WTF
Chemical = ammonia (annual) 6 MGD
Chronic averaging period = 30
WLAa = 110
WLAc = 28
Q.L. = 0.20
# samples/mo. = 30
# samples/wk. = 8

Summary of Statistics:

observations = 1
Expected Value = 9
Variance = 29.16
C.V. = 0.6
97th percentile daily values = 21.9007
97th percentile 4 day average = 14.9741
97th percentile 30 day average= 10.8544
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

9

5/6/2010 4:29:13 PM

Facility = Christiansburg WTF
Chemical = ammonia (wet season) 6 MGD
Chronic averaging period = 30
WLAa = 130
WLAc = 80
Q.L. = 0.20
# samples/mo. = 30
# samples/wk. = 8

Summary of Statistics:

observations = 1
Expected Value = 9
Variance = 29.16
C.V. = 0.6
97th percentile daily values = 21.9007
97th percentile 4 day average = 14.9741
97th percentile 30 day average= 10.8544
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

9

5/6/2010 4:22:25 PM

Facility = Christiansburg WTF
Chemical = copper - 6 MGD
Chronic averaging period = 4
WLAa = 190
WLAc = 160
Q.L. = 3
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 3
Expected Value = 8
Variance = 23.04
C.V. = 0.6
97th percentile daily values = 19.4673
97th percentile 4 day average = 13.3103
97th percentile 30 day average= 9.64842
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

8
6
10

5/6/2010 4:20:05 PM

Facility = Christiansburg WTF
Chemical = zinc - 6 MGD
Chronic averaging period = 4
WLAa = 1800
WLAc = 2200
Q.L. = 10
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 3
Expected Value = 57.3333
Variance = 1183.36
C.V. = 0.6
97th percentile daily values = 139.515
97th percentile 4 day average = 95.3906
97th percentile 30 day average= 69.1470
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

62
43
67

5/7/2010 2:23:22 PM

Facility = Christiansburg WTF
Chemical = ammonia (annual) 8 MGD
Chronic averaging period = 30
WLAa = 84
WLAc = 21
Q.L. = 0.20
# samples/mo. = 30
# samples/wk. = 8

Summary of Statistics:

observations = 1
Expected Value = 9
Variance = 29.16
C.V. = 0.6
97th percentile daily values = 21.9007
97th percentile 4 day average = 14.9741
97th percentile 30 day average= 10.8544
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

9

5/7/2010 2:27:08 PM

Facility = Christiansburg WTF
Chemical = ammonia (wet season) 8 MGD
Chronic averaging period = 30
WLAa = 99
WLAc = 60
Q.L. = 0.20
# samples/mo. = 30
# samples/wk. = 8

Summary of Statistics:

observations = 1
Expected Value = 9
Variance = 29.16
C.V. = 0.6
97th percentile daily values = 21.9007
97th percentile 4 day average = 14.9741
97th percentile 30 day average= 10.8544
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

9

5/7/2010 2:30:07 PM

Facility = Christiansburg WTF
Chemical = copper - 8 MGD
Chronic averaging period = 4
WLAa = 150
WLAc = 120
Q.L. = 3
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 3
Expected Value = 8
Variance = 23.04
C.V. = 0.6
97th percentile daily values = 19.4673
97th percentile 4 day average = 13.3103
97th percentile 30 day average= 9.64842
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

8
6
10

5/7/2010 2:33:04 PM

Facility = Christiansburg WTF
Chemical = zinc - 8 MGD
Chronic averaging period = 4
WLAa = 1300
WLAc = 1600
Q.L. = 10
# samples/mo. = 1
# samples/wk. = 1

Summary of Statistics:

observations = 3
Expected Value = 57.3333
Variance = 1183.36
C.V. = 0.6
97th percentile daily values = 139.515
97th percentile 4 day average = 95.3906
97th percentile 30 day average= 69.1470
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

No Limit is required for this material

The data are:

62
43
67

APPENDIX H

WHOLE EFFLUENT TOXICITY (WET)

Justification Memo

Attachments to Memo
WETLIM printouts
6 MGD
8 MGD

MEMORANDUM

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY
Blue Ridge Regional Office
3019 Peters Creek Road
Roanoke, Virginia 24019

SUBJECT: Whole Effluent Toxicity (WET) Justification for VPDES Permit Reissuance
Town of Christiansburg WWTF
VPDES Permit VA0061751

TO: WET File

FROM: Bob Tate, water permit writer

DATE: June 11, 2010

BACKGROUND:

WET testing was initiated with the issuance of the 1995 VPDES permit and will continue in the reissued permit. The facility meets the applicability requirements in the DEQ Water Division's WET Implementation Guidance. Also, in accordance with 9 VAC 25-31-220.D.1.b. of the *VPDES Permit Regulation*,

> "When determining whether a discharge causes, has the reasonable potential to cause, or contributes to an instream excursion above a narrative or numeric criteria within a Virginia water quality standard, the Board shall use procedures which account for existing controls on point and nonpoint sources of pollution, the variability of the pollutant or pollutant parameter in the effluent, the sensitivity of the species to toxicity testing (when evaluating whole effluent toxicity), and where appropriate, the dilution of the effluent in the receiving water."

The WET testing requirement procedure should address the sensitivity of the species to toxicity testing and allows the Board to determine whether the discharge causes, has the reasonable potential to cause, or contributes to an instream excursion above a narrative or numeric criteria within a Virginia water quality standard.

CURRENT WET REQUIREMENTS:

The current permit (2005-2010) contains flow tiers of 4.0 MGD, 6.0 MGD, and 8.0 MGD. Operation at 4.0 MGD requires annual acute 48-hour WET static tests using *Ceriodaphnia dubia* and *Pimephales promelas* with representative 24-hour flow-proportioned composite samples collected from Outfall 001. The acute tests are conducted "... with a minimum of 5 dilutions, derived geometrically, for calculation of a valid LC_{50}." Reporting results are expressed as TU_a (acute toxic units) by dividing $100/LC_{50}$. The test dilutions should determine compliance with the following endpoint: acute LC_{50} of 5% equivalent to a TU_a of 20.0.

At 6.0 MGD operation, the current permit requires quarterly chronic WET static tests using *Ceriodaphnia dubia* and *Pimephales promelas* with representative 24-hour flow-proportioned composite samples collected from Outfall 001. The chronic tests are to be conducted in such a manner and at sufficient dilutions (minimum of five dilutions, derived geometrically) to determine the "No Observed Effect Concentration" (NOEC) for survival and growth. Tests producing a NOEC less than the lowest dilution tested are not acceptable and must be repeated. NOEC is to be expressed as TU_c (Chronic Toxic Units), by dividing 100/NOEC for reporting. LC50 at 48 hours and the IC25 with the NOECs are to be included in the test report. Test dilutions should be able to determine compliance with the following endpoint: chronic NOEC of 6% equivalent to a TUc of 16.66.

The test data may be evaluated for reasonable potential at the conclusion of the test period. The data may be evaluated sooner if requested by the permittee, or if toxicity has been noted. Should evaluation of the data indicate that a limit is needed, a WET limit and compliance schedule will be required. The permittee shall report the results with the DMR and supply one copy of each toxicity test beginning no later than 6 months after the date a CTO is issued for the expanded 6.0 MGD facility.

All testing under the 2005-2010 permit was conducted per 4.0 MGD flow tier requirements. Results were excellent. Below is a summary of test results.

Christiansburg WWTF Acute Toxicity Test Results for Outfall 001		
Reporting Period: Testing Dates	***Ceriodaphnia dubia* $LC_{50} \rightarrow TU_a$**	***Pimephales promelas* $LC_{50} \rightarrow TU_a$**
1st Annual: Dec. 7-9, 2005	**LC_{50}>100% → TU_a< 1.0**	**LC_{50}>100% → TU_a< 1.0**
2nd Annual: Feb. 7-9, 2007	**LC_{50}>100% → TU_a< 1.0**	**LC_{50}>100% → TU_a< 1.0**
3rd Annual: Nov. 28-30, 2007	**LC_{50}>100% → TU_a< 1.0**	**LC_{50}>100% → TU_a< 1.0**
4th Annual: Nov. 5-7, 2008	**LC_{50}>100% → TU_a< 1.0**	**LC_{50}>100% → TU_a< 1.0**
5th Annual: Dec. 2-4, 2009	**LC_{50}>100% → TU_a< 1.0**	**LC_{50}>100% → TU_a< 1.0**

$TU_a = 100 \div LC_{50}$

Test labs: Olver, Inc and Coastal Bioanalysts, Inc.
Permit compliance endpoint: acute LC_{50} of 5% equivalent to a TU_a of 20.00

NEXT PERMIT:

Design capacity at the start of the next permit period (September 26, 2010) is expected to be 6.0 MGD. The permit is expected to contain flow tiers for 6.0 MGD and 8.0 MGD design flows (only). The quarterly chronic WET static tests using *Ceriodaphnia dubia* and *Pimephales promelas* for 6.0 MGD flow tier in the current permit are appropriate. The same tests appear to be appropriate for the 8.0 MGD tier. WETLIM10 determined the compliance endpoints to be chronic NOEC of 6% equivalent to 16.67 TUc. The reporting schedule will require 10 quarterly and 2 annual testing events. Permit language will be modified to include details for chronic testing per guidance.

CORMIX modeling in 2005 assumed Crab Creek flows were part of 1Q10 and 7Q10 per 2005 flow frequency memo. 2010 flow frequency determinations and subsequently related calculations do not include Crab Creek flows.

Comparing acute (1Q10) and chronic (7Q10) flows used in permitting calculations for 2005 and 2010:

% difference = 2005 – (2010/2005)

1Q10 471 MGD – 467 MGD / 471 MGD = 0.849 %

7Q10 596 MGD – 577 MGD / 596 MGD = 3.19 %

0.85% and 3.2% differences do not appear significant considering:

a. possible CORMIX modeling errors;

b. possible flow frequency errors (individual site measurements & regression analysis);

c. 2010 flow statistics used data through 2003 and compiled in 2005

Otherwise entire CORMIX modeling would have to be repeated at significant cost to permittee.

Spreadsheet for determination of WET test endpoints or WET limits

Excel 97
Revision Date: 01/10/05
File: WETLIM10.xls
(MIX.EXE required also)

Enter data in the cells with blue type:

Entry Date:	06/22/10
Facility Name:	
VPDES Number:	VA0061751
Outfall Number:	1
Plant Flow:	6 MGD
Acute 1Q10:	467 MGD
Chronic 7Q10:	577 MGD

Acute Endpoint/Permit Limit			Use as LC_{50} in Special Condition, as TUa on DMR				
ACUTE	1.980000049	TUa	LC_{50} =	51	% Use as	1.96	TUa
ACUTE WLAa	1.98		Note: Inform the permittee that if the mean of the data exceeds this TUa:	1.0		a limit may result using WLA.EXE	

Chronic Endpoint/Permit Limit			Use as NOEC in Special Condition, as TUc on DMR				
CHRONIC	19.80000049	TU_c	NOEC =	6	% Use as	16.66	TU_c
BOTH*	19.80000049	TU_c	NOEC =	6	% Use as	16.66	TU_c
AML	19.80000049	TU_c	NOEC =	6	% Use as	16.66	TU_c

ACUTE WLAa,c	19.8	Note: Inform the permittee that if the mean of the data exceeds this TUc:	8.13670468
CHRONIC WLAc	23.8	a limit may result using WLA.EXE	
* Both means acute expressed as chronic			

% Flow to be used from MIX.EXE		Diffuser /modeling study?	
		Enter Y/N	y
100	%	Acute	6.6 :1
100	%	Chronic	23.8 :1

Are data available to calculate CV? (Y/N) N (Minimum of 10 data points, same species, needed) Go to Page 2
Are data available to calculate ACR? (Y/N) N (NOEC<LC50, do not use greater/less than data) Go to Page 3

IWC_a	15.15151515 %	Plant flow/plant flow + 1Q10	NOTE: If the IWCa is >33%, specify the
IWC_c	4.201680672 %	Plant flow/plant flow + 7Q10	NOAEC = 100% test/endpoint for use
Dilution, acute	6.6	100/IWCa	
Dilution, chronic	23.8	100/IWCc	
WLA_a	1.98	Instream criterion (0.3 TUa) X's Dilution, acute	
WLA_c	23.8	Instream criterion (1.0 TUc) X's Dilution, chronic	
$WLA_{a,c}$	19.8	ACR X's WLA_a - converts acute WLA to chronic units	
ACR -acute/chronic ratio	10	LC50/NOEC (Default is 10 - if data are available, use tables Page 3)	
CV-Coefficient of variation	0.6	Default of 0.6 - if data are available, use tables Page 2)	
Constants eA	0.4109447	Default = 0.41	
eB	0.6010373	Default = 0.60	
eC	2.4334175	Default = 2.43	
eD	2.4334175	Default = 2.43 (1 samp) No. of samples: 1	

**The Maximum Daily Limit is calculated from the lowest LTA, X's eC. The LTAa,c and MDL using it are driven by the ACR.

$LTA_{a,c}$	8.13670506	WLAa,c X's eA				Rounded NOEC's	%
LTA_c	14.30468774	WLAc X's eB					
MDL** with $LTA_{a,c}$	19.80000049	TU_c	NOEC =	5.050505	(Protects from acute/chronic toxicity)	NOEC = 6	%
MDL** with LTA_c	34.80927748	TU_c	NOEC =	2.872797	(Protects from chronic toxicity)	NOEC = 3	%
AML with lowest LTA	19.80000049	TU_c	NOEC =	5.050505	Lowest LTA X's eD	NOEC = 6	

IF ONLY ACUTE ENDPOINT/LIMIT IS NEEDED, CONVERT MDL FROM TU_c to TU_a

						Rounded LC50's	%
MDL with $LTA_{a,c}$	1.980000049	TU_a	LC50 =	50.505049	%	LC50 = 51	%
MDL with LTA_c	3.480927748	TU_a	LC50 =	28.727973	%	LC50 = 29	

Page 2 - Follow the directions to develop a site specific CV (coefficient of variation)

IF YOU HAVE AT LEAST 10 DATA POINTS THAT ARE QUANTIFIABLE (NOT "<" OR ">") FOR A SPECIES, ENTER THE DATA IN EITHER COLUMN "G" (VERTEBRATE) OR COLUMN "J" (INVERTEBRATE). THE 'CV' WILL BE PICKED UP FOR THE CALCULATIONS BELOW. THE DEFAULT VALUES FOR eA, eB, AND eC WILL CHANGE IF THE 'CV' IS ANYTHING OTHER THAN 0.6.

	Vertebrate IC_{25} Data or LC_{50} Data	LN of data		Invertebrate IC_{25} Data or LC_{50} Data	LN of data
	**********			**********	
1	0		1	0	
2			2		
3			3		
4			4		
5			5		
6			6		
7			7		
8			8		
9			9		
10			10		
11			11		
12			12		
13			13		
14			14		
15			15		
16			16		
17			17		
18			18		
19			19		
20			20		

Coefficient of Variation for effluent tests

CV = 0.6 (Default 0.6)

δ^2 = 0.3074847

δ = 0.554513029

Using the log variance to develop eA

(P. 100, step 2a of TSD)

Z = 1.881 (97% probability stat from table

A = -0.88929666

eA = 0.410944686

Using the log variance to develop eB

(P. 100, step 2b of TSD)

		St Dev	NEED DATA	NEED DATA	St Dev	NEED DATA	NEED DATA
δ_4^2 =	0.086177696	Mean	0	0	Mean	0	0
δ_4 =	0.293560379	Variance	0	0.000000	Variance	0	0.000000
B =	-0.50909823	CV	0		CV	0	
eB =	0.601037335						

Using the log variance to develop eC

(P. 100, step 4a of TSD)

δ^2 = 0.3074847

δ = 0.554513029

C = 0.889296658

eC = 2.433417525

Using the log variance to develop eD

(P. 100, step 4b of TSD)

n = 1 This number will most likely stay as "1", for 1 sample/month.

δ_n^2 = 0.3074847

δ_n = 0.554513029

D = 0.889296658

eD = 2.433417525

Page 3 - Follow directions to develop a site specific ACR (Acute to Chronic Ratio)

To determine Acute/Chronic Ratio (ACR), insert usable data below. Usable data is defined as valid paired test results, acute and chronic, tested at the same temperature, same species. The chronic NOEC must be less than the acute LC_{50}, since the ACR divides the LC_{50} by the NOEC. LC_{50}'s >100% should not be used.

Table 1. ACR using Vertebrate data

Set #	LC_{50}	NOEC	Test ACR	Logarithm	Geomean	Antilog	ACR to Use
1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
				ACR for vertebrate data:			0

Table 1. Result:	Vertebrate ACR	0
Table 2. Result:	Invertebrate ACR	0
	Lowest ACR	Default to 10

Table 2. ACR using Invertebrate data

Set #	LC_{50}	NOEC	Test ACR	Logarithm	Geomean	Antilog	ACR to Use
1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
				ACR for vertebrate data:			0

DILUTION SERIES TO RECOMMEND

Table 4.

	Monitoring		Limit	
	% Effluent	TUc	% Effluent	TUc
Dilution series based on data mean	12.3	8.1367047		
Dilution series to use for limit			6	16.666667
Dilution factor to recommend:	0.3505708		0.244949	
Dilution series to recommend:	100.0	1.00	100.0	1.00
	35.1	2.85	24.5	4.08
	12.3	8.14	6.0	16.67
	4.3	23.21	1.5	68.04
	1.51	66.21	0.4	277.78
Extra dilutions if needed	0.53	188.85	0.1	1134.02
	0.19	538.70	0.0	4629.63

Convert LC_{50}'s and NOEC's to Chronic TU's for use in WLA.EXE

Table 3. ACR used: 10

	Enter LC_{50}	TUc	Enter NOEC	TUc
1		NO DATA		NO DATA
2		NO DATA		NO DATA
3		NO DATA		NO DATA
4		NO DATA		NO DATA
5		NO DATA		NO DATA
6		NO DATA		NO DATA
7		NO DATA		NO DATA
8		NO DATA		NO DATA
9		NO DATA		NO DATA
10		NO DATA		NO DATA
11		NO DATA		NO DATA
12		NO DATA		NO DATA
13		NO DATA		NO DATA
14		NO DATA		NO DATA
15		NO DATA		NO DATA
16		NO DATA		NO DATA
17		NO DATA		NO DATA
18		NO DATA		NO DATA
19		NO DATA		NO DATA
20		NO DATA		NO DATA

If WLA.EXE determines that an acute limit is needed, you need to convert the TUc answer you get to TUa and then an LC50, enter it here: NO DATA %LC_{50}

NO DATA TUa

Cell: I9
Comment:
This is assuming that the data are Type 2 data (none of the data in the data set are censored - "<" or ">").

Cell: K18
Comment: This is assuming that the data are Type 2 data (none of the data in the data set are censored - "<" or ">").

Cell: J22
Comment: Remember to change the "N" to "Y" if you have ratios entered, otherwise, they won't be used in the calculations.

Cell: C40
Comment:
If you have entered data to calculate an ACR on page 3, and this is still defaulted to "10", make sure you have selected "Y" in cell E21

Cell: C41
Comment: If you have entered data to calculate an effluent specific CV on page 2, and this is still defaulted to "0.6", make sure you have selected "Y" in cell E20

Cell: L48
Comment:
See Row 151 for the appropriate dilution series to use for these NOEC's

Cell: G62
Comment:
Vertebrates are:
Pimephales promelas
Oncorhynchus mykiss
Cyprinodon variegatus

Cell: J62
Comment:
Invertebrates are:
Ceriodaphnia dubia
Mysidopsis bahia

Cell: C117
Comment: Vertebrates are:

Pimephales promelas
Cyprinodon variegatus

Cell: M119
Comment: The ACR has been picked up from cell C34 on Page 1. If you have paired data to calculate an ACR, enter it in the tables to the left, and make sure you have a "Y" in cell E21 on Page 1. Otherwise, the default of 10 will be used to convert your acute data.

Cell: M121
Comment: If you are only concerned with acute data, you can enter it in the NOEC column for conversion and the number calculated will be equivalent to the TUa. The calculation is the same: 100/NOEC = TUc or 100/LC50 = TUa.

Cell: C138
Comment: Invertebrates are:

Ceriodaphnia dubia
Mysidopsis bahia

Spreadsheet for determination of WET test endpoints or WET limits

Excel 97
Revision Date: 01/10/05
File: WETLIM10.xls
(MIX.EXE required also)

Enter data in the cells with blue type:

Entry Date:	06/22/10
Facility Name:	
VPDES Number:	VA0061751
Outfall Number:	1

Plant Flow:	8	MGD	
Acute 1Q10:	467	MGD	100 %
Chronic 7Q10:	577	MGD	100 %

Acute Endpoint/Permit Limit — **Use as LC_{50} in Special Condition, as TUa on DMR**

ACUTE	1.980000049	TUa	LC_{50} =	51	% Use as	1.96 TUa

ACUTE WLAa 1.98

Note: Inform the permittee that if the mean of the data exceeds this TUa: 1.0 a limit may result using WLA.EXE

Chronic Endpoint/Permit Limit — **Use as NOEC in Special Condition, as TUc on DMR**

CHRONIC	19.80000049	TU_c	NOEC =	6	% Use as	16.66 TU_c
BOTH*	19.80000049	TU_c	NOEC =	6	% Use as	16.66 TU_c
AML	19.80000049	TU_c	NOEC =	6	% Use as	16.66 TU_c

ACUTE WLAa,c 19.8
CHRONIC WLAc 22.2
* Both means acute expressed as chronic

Note: Inform the permittee that if the mean of the data exceeds this TUc: 8.13670468 a limit may result using WLA.EXE

% Flow to be used from MIX.EXE

Difuser /modeling study?

Enter Y/N y
Acute 6.6 :1
Chronic 22.2 :1

Are data available to calculate CV? (Y/N) N (Minimum of 10 data points, same species, needed) Go to Page 2
Are data available to calculate ACR? (Y/N) N (NOEC<LC50, do not use greater/less than data) Go to Page 3

IWC_a	15.15151515	%	Plant flow/plant flow + 1Q10
IWC_c	4.504504505	%	Plant flow/plant flow + 7Q10

NOTE: If the IWCa is >33%, specify the NOAEC = 100% test/endpoint for use

Dilution, acute	6.6	100/IWCa
Dilution, chronic	22.2	100/IWCc

WLA_a	1.98	Instream criterion (0.3 TUa) X's Dilution, acute
WLA_c	22.2	Instream criterion (1.0 TUc) X's Dilution, chronic
$WLA_{a,c}$	19.8	ACR X's WLA_a - converts acute WLA to chronic units

ACR -acute/chronic ratio	10	LC50/NOEC (Default is 10 - if data are available, use tables Page 3)
CV-Coefficient of variation	0.6	Default of 0.6 - if data are available, use tables Page 2)

Constants	eA	0.4109447	Default = 0.41
	eB	0.6010373	Default = 0.60
	eC	2.4334175	Default = 2.43
	eD	2.4334175	Default = 2.43 (1 samp)

No. of samples: 1

****The Maximum Daily Limit is calculated from the lowest LTA, X's eC. The LTAa,c and MDL using it are driven by the ACR.**

$LTA_{a,c}$	8.13670506	WLAa,c X's eA			
LTA_c	13.34302806	WLAc X's eB			
MDL** with $LTA_{a,c}$	19.80000049	TU_c	NOEC =	5.050505	(Protects from acute/chronic toxicity)
MDL** with LTA_c	32.46915798	TU_c	NOEC =	3.079846	(Protects from chronic toxicity)
AML with lowest LTA	19.80000049	TU_c	NOEC =	5.050505	Lowest LTA X's eD

IF ONLY ACUTE ENDPOINT/LIMIT IS NEEDED, CONVERT MDL FROM TU_c to TU_a

MDL with $LTA_{a,c}$	1.980000049	TU_a	LC50 =	50.505049	%
MDL with LTA_c	3.246915798	TU_a	LC50 =	30.798458	%

Rounded NOEC's

NOEC =	6	%
NOEC =	4	%
NOEC =	6	

Rounded LC50's

LC50 =	51	%
LC50 =	31	

Page 2 - Follow the directions to develop a site specific CV (coefficient of variation)

IF YOU HAVE AT LEAST 10 DATA POINTS THAT ARE QUANTIFIABLE (NOT "<" OR ">") FOR A SPECIES, ENTER THE DATA IN EITHER COLUMN "G" (VERTEBRATE) OR COLUMN "J" (INVERTEBRATE). THE 'CV' WILL BE PICKED UP FOR THE CALCULATIONS BELOW. THE DEFAULT VALUES FOR eA, eB, AND eC WILL CHANGE IF THE 'CV' IS ANYTHING OTHER THAN 0.6.

Coefficient of Variation for effluent tests

CV = 0.6 (Default 0.6)

δ^2 = 0.3074847

δ = 0.554513029

Using the log variance to develop eA

(P. 100, step 2a of TSD)

Z = 1.881 (97% probability stat from table

A = -0.88929666

eA = 0.410944686

Using the log variance to develop eB

(P. 100, step 2b of TSD)

δ_4^2 = 0.086177696

δ_4 = 0.293560379

B = -0.50909823

eB = 0.601037335

Using the log variance to develop eC

(P. 100, step 4a of TSD)

δ^2 = 0.3074847

δ = 0.554513029

C = 0.889296658

eC = 2.433417525

Using the log variance to develop eD

(P. 100, step 4b of TSD)

n = 1 This number will most likely stay as "1", for 1 sample/month.

δ_n^2 = 0.3074847

δ_n = 0.554513029

D = 0.889296658

eD = 2.433417525

	Vertebrate IC_{25} Data or LC_{50} Data	LN of data		Invertebrate IC_{25} Data or LC_{50} Data	LN of data
	**********			**********	
1	0		1	0	
2			2		
3			3		
4			4		
5			5		
6			6		
7			7		
8			8		
9			9		
10			10		
11			11		
12			12		
13			13		
14			14		
15			15		
16			16		
17			17		
18			18		
19			19		
20			20		
St Dev	NEED DATA	NEED DATA	St Dev	NEED DATA	NEED DATA
Mean	0	0	Mean	0	0
Variance	0	0.000000	Variance	0	0.000000
CV	0		CV	0	

Page 3 - Follow directions to develop a site specific ACR (Acute to Chronic Ratio)

To determine Acute/Chronic Ratio (ACR), insert usable data below. Usable data is defined as valid paired test results, acute and chronic, tested at the same temperature, same species. The chronic NOEC must be less than the acute LC_{50}, since the ACR divides the LC_{50} by the NOEC. LC_{50}'s >100% should not be used.

Table 1. ACR using Vertebrate data

Set #	LC_{50}	NOEC	Test ACR	Logarithm	Geomean	Antilog	ACR to Use
1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
				ACR for vertebrate data:			0

Table 1. Result:	Vertebrate ACR	0
Table 2. Result:	Invertebrate ACR	0
	Lowest ACR	Default to 10

Table 2. ACR using Invertebrate data

Set #	LC_{50}	NOEC	Test ACR	Logarithm	Geomean	Antilog	ACR to Use
1	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
2	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
3	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
4	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
5	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
6	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
7	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
8	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
9	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
10	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	NO DATA
				ACR for vertebrate data:			0

DILUTION SERIES TO RECOMMEND

Table 4.

	Monitoring		Limit	
	% Effluent	TUc	% Effluent	TUc
Dilution series based on data mean	12.3	8.1367047		
Dilution series to use for limit			6	16.666667
Dilution factor to recommend:	0.3505708		0.244949	
Dilution series to recommend:	100.0	1.00	100.0	1.00
	35.1	2.85	24.5	4.08
	12.3	8.14	6.0	16.67
	4.3	23.21	1.5	68.04
	1.51	66.21	0.4	277.78
Extra dilutions if needed	0.53	188.85	0.1	1134.02
	0.19	538.70	0.0	4629.63

Convert LC_{50}'s and NOEC's to Chronic TU's for use in WLA.EXE

Table 3. ACR used: 10

	Enter LC_{50}	TUc	Enter NOEC	TUc
1		NO DATA		NO DATA
2		NO DATA		NO DATA
3		NO DATA		NO DATA
4		NO DATA		NO DATA
5		NO DATA		NO DATA
6		NO DATA		NO DATA
7		NO DATA		NO DATA
8		NO DATA		NO DATA
9		NO DATA		NO DATA
10		NO DATA		NO DATA
11		NO DATA		NO DATA
12		NO DATA		NO DATA
13		NO DATA		NO DATA
14		NO DATA		NO DATA
15		NO DATA		NO DATA
16		NO DATA		NO DATA
17		NO DATA		NO DATA
18		NO DATA		NO DATA
19		NO DATA		NO DATA
20		NO DATA		NO DATA

If WLA.EXE determines that an acute limit is needed, you need to convert the TUc answer you get to TUa and then an LC50, enter it here: NO DATA $\%LC_{50}$ NO DATA TUa

Cell: I9
Comment:
This is assuming that the data are Type 2 data (none of the data in the data set are censored - "<" or ">").

Cell: K18
Comment: This is assuming that the data are Type 2 data (none of the data in the data set are censored - "<" or ">").

Cell: J22
Comment: Remember to change the "N" to "Y" if you have ratios entered, otherwise, they won't be used in the calculations.

Cell: C40
Comment:
If you have entered data to calculate an ACR on page 3, and this is still defaulted to "10", make sure you have selected "Y" in cell E21

Cell: C41
Comment: If you have entered data to calculate an effluent specific CV on page 2, and this is still defaulted to "0.6", make sure you have selected "Y" in cell E20

Cell: L48
Comment:
See Row 151 for the appropriate dilution series to use for these NOEC's

Cell: G62
Comment:
Vertebrates are:
Pimephales promelas
Oncorhynchus mykiss
Cyprinodon variegatus

Cell: J62
Comment:
Invertebrates are:
Ceriodaphnia dubia
Mysidopsis bahia

Cell: C117
Comment: Vertebrates are:

Pimephales promelas
Cyprinodon variegatus

Cell: M119
Comment: The ACR has been picked up from cell C34 on Page 1. If you have paired data to calculate an ACR, enter it in the tables to the left, and make sure you have a "Y" in cell E21 on Page 1. Otherwise, the default of 10 will be used to convert your acute data.

Cell: M121
Comment: If you are only concerned with acute data, you can enter it in the NOEC column for conversion and the number calculated will be equivalent to the TUa. The calculation is the same: 100/NOEC = TUc or 100/LC50 = TUa.

Cell: C138
Comment: Invertebrates are:

Ceriodaphnia dubia
Mysidopsis bahia

APPENDIX I

DISSOLVED OXYGEN MODELING

Rationale Memo
Attachments to Memo
6 MGD Model (2010)
8 MGD Model (2010)
New River DO and Temperature Data (2007)

6 MGD Model (2005)

8 MGD Model (1996)

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY - WATER DIVISION
Blue Ridge Regional Office
3019 Peters Creek Road Roanoke, Virginia 24019

SUBJECT: Dissolved Oxygen Modeling
Town of Christiansburg Wastewater Treatment Plant – VA0061751

FROM: Bob Tate, water permit writer

DATE: May 25, 2010

This memo describes dissolved oxygen (DO) modeling to predict compliance with DO water quality standards (WQS). DO water quality criteria (WQC) for Class IV (mountain zones waters) are 4.0 mg/L (minimum) and 5.0 mg/L (daily average). Antidegradation applies to the discharge.

The modeling tool allows for one of two methods to determine flow: comparison of drainage areas or direct comparison of measured flows. The flow comparison method was used. 7Q10 flow data for STORET Station 9-NEW081.72 near the Route 11 Bridge in Radford provided a base flow. 7Q10 flow at the discharge point had been previously calculated for flow frequency determinations. Flow from Crab Creek was not included in the models. Crab Creek's mouth is approximately 500 feet downstream of the instream diffuser that discharges treated effluent. A channel parallel to the New River prohibits all of Crab Creek entering the New River until approximately 2000 feet downstream of the mouth. For modeling purposes, ignoring Crab Creek flow simplifies flow considerations and results in a more conservative analysis. Consequently the models contain a single short stream segment 2500' (0.47 miles) long. Stream width was estimated at 500 feet from available aerial imagery.

Background (Receiving Stream) Data
7Q10 flow came from flow frequency determinations. The model supplied default cBOD and TKN values. DO and temperature data came from the Federal Energy Regulatory Commission (FERC) relicensing study report for American Electric Power's Claytor Project. DO and temperature data were collected at New River mile 78.97 (near Plum Creek) from June though October of 2007. Data were collected for nineteen consecutive weeks from June 19 through October 24. Three to eight tests were made one day a week. Daily tests were averaged to represent a weekly average. The nineteen weekly averages were averaged and used as input data for the models. The data are assumed representative of conservative conditions. June – October is part of the low flow period (June – December) when water temperatures are highest and consequent DO values are lowest. (DO and temperature data summaries are attached.)

Discharge Data
Models were developed for 6 MGD and 8 MGD flow tiers (attached). The monthly average secondary treatment standard (30 mg/L) was used for cBOD. TKN was determined by adding 3 mg/L to the 9 mg/L assumed for municipal wastewater treatment facilities. DO was the current permit limit: 6.0 mg/L. Discharge temperature was the 90% annual effluent temperature value calculated for the waste load allocation spreadsheet. Data to determine discharge temperature came from daily operational logs for 2009.

Modeling Segmentation

The single segment in the models represents the New River from the outfall (instream diffuser) to approximately 2500 feet downstream. At the downstream point all Crab Creek flow has entered the river. USGS topographic map (Radford - North) indicates the river surface drops 20 feet over approximately 38,000 feet of run. The calculated slope was used to project elevations at the start and end of the segment using the 1700 foot contour near the Route 114 Bridge as a reference.

Channel Information

The following stream observations were made on March 31, 2010. .

cross section shape: rectangular
character: mostly straight
pools: 60% with 3 feet average depth
riffles: 40% with 1 foot average depth
bottom: gravel, small rock, large rock, boulders
sludge: none
plants: no rooted plants
algae on bottom
no green color in water

The above data were input into the modeling tool with two modifications. "Large rock" was selected to represent bottom type; the modeling tool allows for only one descriptor. The modeling tool indicated that calculated depth was inconsistent with pool and riffle input data, so pool and riffle data were revised to: pools: 75% with 4 feet average depth;
riffles: 25% with 1 foot average depth.

Modeling Outcomes and Conclusions

Both 6 MGD and 8 MGD models predict:

DO WQC are met.
DO increases from the discharge point to the end of the segment.

Consequently there are no DO antidegradation violations (no DO drop > 0.2 mg/L).
A 6 mg/L minimum DO limit and BOD secondary treatment standards limits (30 mg/L monthly average and 45 mg/L maximum weekly average) will satisfy DO WQS.
(Separate reasonable potential analyses for ammonia indicate nitrogen limits are not needed.)

Attachments: Modeling documentation for 6 MGD and 8 MGD discharges
DO and temperature data summaries from FERC relicensing report

"Model Run For I:\rstate\Christiansburg\DO Modeling\Christiansburg WWTF - 6 MGD.mod
On 5/25/2010 2:08:37 PM"

"Model is for NEW RIVER."
"Model starts at the CHRISTIANSBURG WWTF discharge."

"Background Data"

"7Q10"	"cBOD5"	"TKN"	"DO"	"Temp"
"(mgd)"	"(mg/l)"	"(mg/l)"	"(mg/l)"	"deg C"
577,	2,	0,	6.4,	22

"Discharge/Tributary Input Data for Segment 1"

"Flow"	"cBOD5"	"TKN"	"DO"	"Temp"
"(mgd)"	"(mg/l)"	"(mg/l)"	"(mg/l)"	"deg C"
6,	30,	12,	,6,	21

"Hydraulic Information for Segment 1"

"Length"	"Width"	"Depth"	"Velocity"
"(mi)"	"(ft)"	"(ft)"	"(ft/sec)"
.47,	500.001,	3.49,	.517

"Initial Mix Values for Segment 1"

"Flow"	"DO"	"cBOD"	"nBOD"	"DOSat"	"Temp"
"(mgd)"	"(mg/l)"	"(mg/l)"	"(mg/l)"	"(mg/l)"	"deg C"
583,	6.396,	5.72,	.401,	8.249,	21.98971

"Rate Constants for Segment 1. - (All units Per Day)"

"k1"	"k1@T"	"k2"	"k2@T"	"kn"	"kn@T"	"BD"	"BD@T"
.3,	.329,	1.66,	1.74,	.15,	.175,	0,	0

"Output for Segment 1"
"Segment starts at CHRISTIANSBURG WWTF"

"Total"	"Segm."			
"Dist."	"Dist."	"DO"	"cBOD"	"nBOD"
"(mi)"	"(mi)"	"(mg/l)"	"(mg/l)"	"(mg/l)"
0,	0,	6.396,	5.72,	.401
.1,	.1,	6.411,	5.698,	.4
.2,	.2,	6.426,	5.676,	.399
.3,	.3,	6.441,	5.654,	.398
.4,	.4,	6.455,	5.632,	.397
.47,	.47,	6.465,	5.617,	.396

"END OF FILE"

REGIONAL MODELING SYSTEM VERSION 4.0

Model Input File for the Discharge to NEW RIVER.

File Information

File Name:	I:\rstate\Christiansburg\DO Modeling\Christiansburg WWTF - 6 MGD.mo
Date Modified:	May 24, 2010

Water Quality Standards Information

Stream Name:	NEW RIVER
River Basin:	New River Basin
Section:	2a
Class:	IV - Mountainous Zones Waters
Special Standards:	PWS, v

Background Flow Information

Gauge Used:	STORET 9-NEW081.72 Route 11 Bridge @ Radford
Gauge Drainage Area:	2748 Sq.Mi.
Gauge 7Q10 Flow:	573 MGD
Headwater Drainage Area:	2785 Sq.Mi.
Headwater 7Q10 Flow:	577 MGD (Net; includes Withdrawals/Discharges)
Withdrawal/Discharges:	0 MGD
Incremental Flow in Segments:	0.2085153 MGD/Sq.Mi.

Background Water Quality

Background Temperature:	22 Degrees C
Background cBOD5:	2 mg/l
Background TKN:	0 mg/l
Background D.O.:	6.4 mg/l

Model Segmentation

Number of Segments:	1
Model Start Elevation:	1705.8 ft above MSL
Model End Elevation:	1704.5 ft above MSL

REGIONAL MODELING SYSTEM VERSION 4.0
Model Input File for the Discharge to NEW RIVER.

Segment Information for Segment 1

Definition Information

Segment Definition:	A discharge enters.
Discharge Name:	CHRISTIANSBURG WWTF
VPDES Permit No.:	VA0061751

Discharger Flow Information

Flow:	6 MGD
cBOD5:	30 mg/l
TKN:	12 mg/l
D.O.:	6 mg/l
Temperature:	21 Degrees C

Geographic Information

Segment Length:	0.47 miles
Upstream Drainage Area:	2785 Sq.Mi.
Downstream Drainage Area:	0 Sq.Mi.
Upstream Elevation:	1705.8 Ft.
Downstream Elevation:	1704.5 Ft.

Hydraulic Information

Segment Width:	500.001 Ft.
Segment Depth:	3.49 Ft.
Segment Velocity:	0.517 Ft./Sec.
Segment Flow:	583 MGD
Incremental Flow:	-580.715 MGD (Applied at end of segment.)

Channel Information

Cross Section:	Rectangular
Character:	Mostly Straight
Pool and Riffle:	Yes
Percent Pools:	75
Percent Riffles:	25
Pool Depth:	4 Ft.
Riffle Depth:	1 Ft.
Bottom Type:	Large Rock
Sludge:	None
Plants:	None
Algae:	On Entire Bottom

"Model Run For I:\rstate\Christiansburg\DO Modeling\Christiansburg WWTF - 8 MGD.mod
On 5/25/2010 2:09:09 PM"

"Model is for NEW RIVER."
"Model starts at the CHRISTIANSBURG WWTF discharge."

"Background Data"

"7Q10"	"cBOD5"	"TKN"	"DO"	"Temp"
"(mgd)"	"(mg/l)"	"(mg/l)"	"(mg/l)"	"deg C"
577,	2,	0,	6.4,	22

"Discharge/Tributary Input Data for Segment 1"

"Flow"	"cBOD5"	"TKN"	"DO"	"Temp"
"(mgd)"	"(mg/l)"	"(mg/l)"	"(mg/l)"	"deg C"
8,	30,	12,	,6,	21

"Hydraulic Information for Segment 1"

"Length"	"Width"	"Depth"	"Velocity"
"(mi)"	"(ft)"	"(ft)"	"(ft/sec)"
.47,	500,	3.497,	.518

"Initial Mix Values for Segment 1"

"Flow"	"DO"	"cBOD"	"nBOD"	"DOSat"	"Temp"
"(mgd)"	"(mg/l)"	"(mg/l)"	"(mg/l)"	"(mg/l)"	"deg C"
585,	6.395,	5.957,	.533,	8.249,	21.98632

"Rate Constants for Segment 1. - (All units Per Day)"

"k1"	"k1@T"	"k2"	"k2@T"	"kn"	"kn@T"	"BD"	"BD@T"
.3,	.329,	1.66,	1.74,	.15,	.175,	0,	0

"Output for Segment 1"
"Segment starts at CHRISTIANSBURG WWTF"

"Total" "Dist."	"Segm." "Dist."	"DO"	"cBOD"	"nBOD"
"(mi)"	"(mi)"	"(mg/l)"	"(mg/l)"	"(mg/l)"
0,	0,	6.395,	5.957,	.533
.1,	.1,	6.409,	5.934,	.532
.2,	.2,	6.423,	5.911,	.531
.3,	.3,	6.436,	5.888,	.53
.4,	.4,	6.449,	5.865,	.529
.47,	.47,	6.458,	5.849,	.528

"END OF FILE"

REGIONAL MODELING SYSTEM VERSION 4.0
Model Input File for the Discharge to NEW RIVER.

File Information

File Name:	I:\rstate\Christiansburg\DO Modeling\Christiansburg WWTF - 8 MGD.mo
Date Modified:	May 24, 2010

Water Quality Standards Information

Stream Name:	NEW RIVER
River Basin:	New River Basin
Section:	2a
Class:	IV - Mountainous Zones Waters
Special Standards:	PWS, v

Background Flow Information

Gauge Used:	STORET 9-NEW081.72 Route 11 Bridge @ Radford
Gauge Drainage Area:	2748 Sq.Mi.
Gauge 7Q10 Flow:	573 MGD
Headwater Drainage Area:	2785 Sq.Mi.
Headwater 7Q10 Flow:	577 MGD (Net; includes Withdrawals/Discharges)
Withdrawal/Discharges:	0 MGD
Incremental Flow in Segments:	0.2085153 MGD/Sq.Mi.

Background Water Quality

Background Temperature:	22 Degrees C
Background cBOD5:	2 mg/l
Background TKN:	0 mg/l
Background D.O.:	6.4 mg/l

Model Segmentation

Number of Segments:	1
Model Start Elevation:	1705.8 ft above MSL
Model End Elevation:	1704.5 ft above MSL

REGIONAL MODELING SYSTEM VERSION 4.0

Model Input File for the Discharge to NEW RIVER.

Segment Information for Segment 1

Definition Information

Segment Definition:	A discharge enters.
Discharge Name:	CHRISTIANSBURG WWTF
VPDES Permit No.:	VA0061751

Discharger Flow Information

Flow:	8 MGD
cBOD5:	30 mg/l
TKN:	12 mg/l
D.O.:	6 mg/l
Temperature:	21 Degrees C

Geographic Information

Segment Length:	0.47 miles
Upstream Drainage Area:	0 Sq.Mi.
Downstream Drainage Area:	1 Sq.Mi.
Upstream Elevation:	1705.8 Ft.
Downstream Elevation:	1704.5 Ft.

Hydraulic Information

Segment Width:	500 Ft.
Segment Depth:	3.497 Ft.
Segment Velocity:	0.518 Ft./Sec.
Segment Flow:	585 MGD
Incremental Flow:	-580.715 MGD (Applied at end of segment.)

Channel Information

Cross Section:	Rectangular
Character:	Mostly Straight
Pool and Riffle:	Yes
Percent Pools:	75
Percent Riffles:	25
Pool Depth:	4 Ft.
Riffle Depth:	1 Ft.
Bottom Type:	Large Rock
Sludge:	None
Plants:	None
Algae:	On Entire Bottom

2007 Claytor Lake Water Quality Data

Date	Time	Station	River Mile	Depth	Dissolved Oxygen (mg/L)		
6/20/2007	6:17	19	78.97	0	6.42	**weekly average**	**6.26**
6/20/2007	6:17	19	78.97	1	6.33		.
6/20/2007	6:17	19	78.97	2	6.28	.	.
6/20/2007	6:24	20	78.97	0	6.45	.	.
6/20/2007	6:24	20	78.97	1	6.22	.	.
6/20/2007	6:30	21	78.97	0	6.08	.	.
6/20/2007	6:30	21	78.97	1	6.06	.	.
6/27/2007	6:05	19	78.97	0	6.14	**weekly average**	**6.05**
6/27/2007	6:05	19	78.97	1	5.93	.	.
6/27/2007	6:05	19	78.97	2	5.85	.	.
6/27/2007	6:09	20	78.97	0	6.16	.	.
6/27/2007	6:09	20	78.97	1	5.86	.	.
6/27/2007	6:11	21	78.97	0	6.5	.	.
6/27/2007	6:11	21	78.97	1	5.93	.	.
7/3/2007	6:09	19	78.97	0	6.05	**weekly average**	**5.94**
7/3/2007	6:09	19	78.97	1	5.99	.	.
7/3/2007	6:09	19	78.97	2	5.97	.	.
7/3/2007	6:14	20	78.97	0	5.97	.	.
7/3/2007	6:14	20	78.97	1	5.89	.	.
7/3/2007	6:17	21	78.97	0	5.87	.	.
7/3/2007	6:17	21	78.97	1	5.85	.	.
7/11/2007	6:19	19	78.97	0	6.17	**weekly average**	**6.16**
7/11/2007	6:19	19	78.97	1	6.14	.	.
7/11/2007	6:19	19	78.97	2	6.1	.	.
7/11/2007	6:22	20	78.97	0	6.2	.	.
7/11/2007	6:22	20	78.97	1	6.47	.	.
7/11/2007	6:24	21	78.97	0	6.1	.	.
7/11/2007	6:24	21	78.97	1	5.95	.	.
7/18/2007	6:23	19	78.97	0	5.98	**weekly average**	**5.85**
7/18/2007	6:23	19	78.97	1	5.92	.	.
7/18/2007	6:23	19	78.97	2	5.91	.	.
7/18/2007	6:26	20	78.97	0	5.84	.	.
7/18/2007	6:26	20	78.97	1	5.82	.	.
7/18/2007	6:30	21	78.97	0	5.73	.	.
7/18/2007	6:30	21	78.97	1	5.72	.	.
7/25/2007	6:42	19	78.97	0	6.29	**weekly average**	**6.17**
7/25/2007	6:42	19	78.97	1	6.23	.	.
7/25/2007	6:42	19	78.97	2	6.2	.	.
7/25/2007	6:42	19	78.97	3	6.23	.	.
7/25/2007	6:46	20	78.97	0	6.15	.	.
7/25/2007	6:46	20	78.97	1	6.13	.	.
7/25/2007	6:48	21	78.97	0	6.1	.	.
7/25/2007	6:48	21	78.97	1	6.06	.	.
7/31/2007	6:35	19	78.97	0	4.9	**weekly average**	**4.92**
7/31/2007	6:35	19	78.97	1	4.95	.	.
7/31/2007	6:35	19	78.97	2	4.9	.	.
7/31/2007	6:40	20	78.97	0	4.79	.	.
7/31/2007	6:40	20	78.97	1	4.77	.	.

7/31/2007	6:42	21	78.97	0	5.05	.	.
7/31/2007	6:42	21	78.97	1	5.08	.	.
8/8/2007	6:46	19	78.97	0	5.6	**weekly average**	**5.56**
8/8/2007	6:46	19	78.97	1	5.58	.	.
8/8/2007	6:46	19	78.97	2	5.57	.	.
8/8/2007	6:48	20	78.97	0	5.56	.	.
8/8/2007	6:48	20	78.97	1	5.53	.	.
8/8/2007	6:50	21	78.97	0	5.54	.	.
8/8/2007	6:50	21	78.97	1	5.53	.	.
8/15/2007	6:36	19	78.97	0	6.5	**weekly average**	**6.46**
8/15/2007	6:33	20	78.97	0	6.45	.	.
8/15/2007	6:30	21	78.97	0	6.44	.	.
8/21/2007	6:37	19	78.97	0	6.85	**weekly average**	**6.83**
8/21/2007	6:34	20	78.97	0	6.84	.	.
8/21/2007	6:30	21	78.97	0	6.8	.	.
8/28/2007	6:51	19	78.97	0	7.9	**weekly average**	**8.07**
8/28/2007	6:49	20	78.97	0	8.16	.	.
8/28/2007	6:45	21	78.97	0	8.14	.	.
9/4/2007	6:55	19	78.97	0	5.05	**weekly average**	**5.02**
9/4/2007	6:54	20	78.97	0	4.86	.	.
9/4/2007	6:51	21	78.97	0	5.14	.	.
9/13/2007	7:09	19	78.97	0	6.04	**weekly average**	**6.17**
9/13/2007	7:06	20	78.97	0	6.16	.	.
9/13/2007	7:02	21	78.97	0	6.32	.	.
9/19/2007	7:24	19	78.97	0	6.63	**weekly average**	**6.55**
9/19/2007	7:24	19	78.97	1	6.56	.	.
9/19/2007	7:24	19	78.97	2	6.58	.	.
9/19/2007	7:29	20	78.97	0	6.52	.	.
9/19/2007	7:29	20	78.97	1	6.5	.	.
9/19/2007	7:31	21	78.97	0	6.52	.	.
9/19/2007	7:31	21	78.97	1	6.51	.	.
9/26/2007	7:14	19	78.97	0	6.37	**weekly average**	**6.52**
9/26/2007	7:12	20	78.97	0	6.62	.	.
9/26/2007	7:09	21	78.97	0	6.56	.	.
10/3/2007	7:17	19	78.97	0	6.33	**weekly average**	**6.46**
10/3/2007	7:14	20	78.97	0	6.53	.	.
10/3/2007	7:10	21	78.97	0	6.53	.	.
10/10/2007	7:24	19	78.97	0	7.25	**weekly average**	**7.47**
10/10/2007	7:21	20	78.97	0	7.57	.	.
10/10/2007	7:17	21	78.97	0	7.6	.	.
10/16/2007	7:28	19	78.97	0	7.63	**weekly average**	**7.94**
10/16/2007	7:24	20	78.97	0	8.08	.	.
10/16/2007	7:19	21	78.97	0	8.11	.	.
10/24/2007	7:35	19	78.97	0	6.91	**weekly average**	**6.88**
10/24/2007	7:32	20	78.97	0	6.94	.	.
10/24/2007	7:28	21	78.97	0	6.8	.	.
						average of weekly averages	6.38

2007 Claytor Lake Water Quality Data

Date	Time	Station	River Mile	Depth	Water Temperature (° C)		
6/20/2007	6:17	19	78.97	0	20.42	**weekly average**	**20.46**
6/20/2007	6:17	19	78.97	1	20.43		.
6/20/2007	6:17	19	78.97	2	20.43	.	.
6/20/2007	6:24	20	78.97	0	20.39	.	.
6/20/2007	6:24	20	78.97	1	20.39	.	.
6/20/2007	6:30	21	78.97	0	20.59	.	.
6/20/2007	6:30	21	78.97	1	20.57	.	.
6/27/2007	6:05	19	78.97	0	20.52	**weekly average**	**20.54**
6/27/2007	6:05	19	78.97	1	20.53	.	.
6/27/2007	6:05	19	78.97	2	20.53	.	.
6/27/2007	6:09	20	78.97	0	20.52	.	.
6/27/2007	6:09	20	78.97	1	20.52	.	.
6/27/2007	6:11	21	78.97	0	20.58	.	.
6/27/2007	6:11	21	78.97	1	20.58	.	.
7/3/2007	6:09	19	78.97	0	21.72	**weekly average**	**21.69**
7/3/2007	6:09	19	78.97	1	21.73	.	.
7/3/2007	6:09	19	78.97	2	21.73	.	.
7/3/2007	6:14	20	78.97	0	21.69	.	.
7/3/2007	6:14	20	78.97	1	21.69	.	.
7/3/2007	6:17	21	78.97	0	21.63	.	.
7/3/2007	6:17	21	78.97	1	21.63	.	.
7/11/2007	6:19	19	78.97	0	23.15	**weekly average**	**23.16**
7/11/2007	6:19	19	78.97	1	23.18	.	.
7/11/2007	6:19	19	78.97	2	23.18	.	.
7/11/2007	6:22	20	78.97	0	23.17	.	.
7/11/2007	6:22	20	78.97	1	23.18	.	.
7/11/2007	6:24	21	78.97	0	23.14	.	.
7/11/2007	6:24	21	78.97	1	23.14	.	.
7/18/2007	6:23	19	78.97	0	22.79	**weekly average**	**22.75**
7/18/2007	6:23	19	78.97	1	22.8	.	.
7/18/2007	6:23	19	78.97	2	22.8	.	.
7/18/2007	6:26	20	78.97	0	22.77	.	.
7/18/2007	6:26	20	78.97	1	22.78	.	.
7/18/2007	6:30	21	78.97	0	22.64	.	.
7/18/2007	6:30	21	78.97	1	22.65	.	.
7/25/2007	6:42	19	78.97	0	21.63	**weekly average**	**21.62**
7/25/2007	6:42	19	78.97	1	21.71	.	.
7/25/2007	6:42	19	78.97	2	21.7	.	.
7/25/2007	6:42	19	78.97	3	21.71	.	.
7/25/2007	6:46	20	78.97	0	21.68	.	.
7/25/2007	6:46	20	78.97	1	21.68	.	.
7/25/2007	6:48	21	78.97	0	21.43	.	.
7/25/2007	6:48	21	78.97	1	21.45	.	.
7/31/2007	6:35	19	78.97	0	22.45	**weekly average**	**22.43**
7/31/2007	6:35	19	78.97	1	22.45	.	.
7/31/2007	6:35	19	78.97	2	22.45	.	.
7/31/2007	6:40	20	78.97	0	22.41	.	.
7/31/2007	6:40	20	78.97	1	22.41	.	.

7/31/2007	6:42	21	78.97	0	22.42	.	.
7/31/2007	6:42	21	78.97	1	22.42	.	.
8/8/2007	6:46	19	78.97	0	24.64	**weekly average**	**24.61**
8/8/2007	6:46	19	78.97	1	24.64	.	.
8/8/2007	6:46	19	78.97	2	24.64	.	.
8/8/2007	6:48	20	78.97	0	24.62	.	.
8/8/2007	6:48	20	78.97	1	24.62	.	.
8/8/2007	6:50	21	78.97	0	24.54	.	.
8/8/2007	6:50	21	78.97	1	24.55	.	.
8/15/2007	6:36	19	78.97	0	23.19	**weekly average**	**22.97**
8/15/2007	6:33	20	78.97	0	22.98	.	.
8/15/2007	6:30	21	78.97	0	22.75	.	.
8/21/2007	6:37	19	78.97	0	24.82	**weekly average**	**24.60**
8/21/2007	6:34	20	78.97	0	24.48	.	.
8/21/2007	6:30	21	78.97	0	24.51	.	.
8/28/2007	6:51	19	78.97	0	24.05	**weekly average**	**23.98**
8/28/2007	6:49	20	78.97	0	23.96	.	.
8/28/2007	6:45	21	78.97	0	23.93	.	.
9/4/2007	6:55	19	78.97	0	23.12	**weekly average**	**22.97**
9/4/2007	6:54	20	78.97	0	23.03	.	.
9/4/2007	6:51	21	78.97	0	22.75	.	.
9/13/2007	7:09	19	78.97	0	22.96	**weekly average**	**22.73**
9/13/2007	7:06	20	78.97	0	22.7	.	.
9/13/2007	7:02	21	78.97	0	22.53	.	.
9/19/2007	7:24	19	78.97	0	20.95	**weekly average**	**20.89**
9/19/2007	7:24	19	78.97	1	20.96	.	.
9/19/2007	7:24	19	78.97	2	20.96	.	.
9/19/2007	7:29	20	78.97	0	20.93	.	.
9/19/2007	7:29	20	78.97	1	20.93	.	.
9/19/2007	7:31	21	78.97	0	20.76	.	.
9/19/2007	7:31	21	78.97	1	20.72	.	.
9/26/2007	7:14	19	78.97	0	22.68	**weekly average**	**22.55**
9/26/2007	7:12	20	78.97	0	22.51	.	.
9/26/2007	7:09	21	78.97	0	22.46	.	.
10/3/2007	7:17	19	78.97	0	21.28	**weekly average**	**21.05**
10/3/2007	7:14	20	78.97	0	20.94	.	.
10/3/2007	7:10	21	78.97	0	20.92	.	.
10/10/2007	7:24	19	78.97	0	21.36	**weekly average**	**21.11**
10/10/2007	7:21	20	78.97	0	21.02	.	.
10/10/2007	7:17	21	78.97	0	20.94	.	.
10/16/2007	7:28	19	78.97	0	19.11	**weekly average**	**18.55**
10/16/2007	7:24	20	78.97	0	18.11	.	.
10/16/2007	7:19	21	78.97	0	18.44	.	.
10/24/2007	7:35	19	78.97	0	19.54	**weekly average**	**19.50**
10/24/2007	7:32	20	78.97	0	19.51	.	.
10/24/2007	7:28	21	78.97	0	19.44	.	.
						average of weekly averages	22.06

Model Run For C:\Documents and Settings\jkwinningham\My Documents\cburgDO6.mod On 4/6/2005 2:11:42 PM

Model is for NEW RIVER.
Model starts at the TOWN OF CHRISTIANSBURG STP discharge.

Background Data

7Q10 (mgd)	cBOD5 (mg/l)	TKN (mg/l)	DO (mg/l)	Temp deg C
596	2	0	7.293	23

Discharge/Tributary Input Data for Segment 1

Flow (mgd)	cBOD5 (mg/l)	TKN (mg/l)	DO (mg/l)	Temp deg C
6	45	40	0	23

Hydraulic Information for Segment 1

Length (mi)	Width (ft)	Depth (ft)	Velocity (ft/sec)
3.5	500	2.372	0.785

Initial Mix Values for Segment 1

Flow (mgd)	DO (mg/l)	cBOD (mg/l)	nBOD (mg/l)	DOSat (mg/l)	Temp deg C
602	7.22	6.071	1.597	8.106	23

Rate Constants for Segment 1. - (All units Per Day)

k1	k1@T	k2	k2@T	kn	kn@T	BD	BD@T
0.3	0.344	3.429	3.681	0.1	0.126	0	0

Output for Segment 1
Segment starts at TOWN OF CHRISTIANSBURG STP

Total Dist. (mi)	Segm. Dist. (mi)	DO (mg/l)	cBOD (mg/l)	nBOD (mg/l)
0	0	7.22	6.071	1.597
0.1	0.1	7.227	6.055	1.595
0.2	0.2	7.234	6.039	1.593
0.3	0.3	7.241	6.023	1.591
0.4	0.4	7.248	6.007	1.589
0.5	0.5	7.255	5.991	1.587
0.6	0.6	7.262	5.975	1.585
0.7	0.7	7.269	5.959	1.583
0.8	0.8	7.275	5.943	1.581
0.9	0.9	7.281	5.927	1.579
1	1	7.287	5.911	1.577
1.1	1.1	7.293	5.895	1.575
1.2	1.2	7.295	5.879	1.573
1.3	1.3	7.295	5.863	1.571
1.4	1.4	7.295	5.847	1.569
1.5	1.5	7.295	5.831	1.567
1.6	1.6	7.295	5.815	1.565
1.7	1.7	7.295	5.799	1.563
1.8	1.8	7.295	5.783	1.561
1.9	1.9	7.295	5.768	1.559
2	2	7.295	5.753	1.557
2.1	2.1	7.295	5.738	1.555
2.2	2.2	7.295	5.723	1.553
2.3	2.3	7.295	5.708	1.551
2.4	2.4	7.295	5.693	1.549
2.5	2.5	7.295	5.678	1.547
2.6	2.6	7.295	5.663	1.545
2.7	2.7	7.295	5.648	1.543
2.8	2.8	7.295	5.633	1.541
2.9	2.9	7.295	5.618	1.539
3	3	7.295	5.603	1.537
3.1	3.1	7.295	5.588	1.535
3.2	3.2	7.295	5.573	1.533
3.3	3.3	7.295	5.558	1.531
3.4	3.4	7.295	5.543	1.529
3.5	3.5	7.295	5.528	1.528

END OF FILE

REGIONAL MODELING SYSTEM VERSION 4.0

Model Input File for the Discharge to NEW RIVER.

File Information

File Name:	I:\jkwinningham\Christiansburg\2005 Permit\DO model\cburgDO6.mod
Date Modified:	April 06, 2005

Water Quality Standards Information

Stream Name:	NEW RIVER
River Basin:	New River Basin
Section:	2a
Class:	IV - Mountainous Zones Waters
Special Standards:	PWS, v

Background Flow Information

Gauge Used:	New River at Radford
Gauge Drainage Area:	2748 Sq.Mi.
Gauge 7Q10 Flow:	589 MGD
Headwater Drainage Area:	0 Sq.Mi.
Headwater 7Q10 Flow:	596 MGD (Net; includes Withdrawals/Discharges)
Withdrawal/Discharges:	0 MGD
Incremental Flow in Segments:	*0.2143377 MGD/Sq.Mi.*

Background Water Quality

Background Temperature:	23 Degrees C
Background cBOD5:	2 mg/l
Background TKN:	0 mg/l
Background D.O.:	7.292689 mg/l

Model Segmentation

Number of Segments:	1
Model Start Elevation:	1710 ft above MSL
Model End Elevation:	1690 ft above MSL

REGIONAL MODELING SYSTEM VERSION 4.0
Model Input File for the Discharge to NEW RIVER.

Segment Information for Segment 1

Definition Information

Segment Definition:	A discharge enters.
Discharge Name:	TOWN OF CHRISTIANSBURG STP
VPDES Permit No.:	VA0061751

Discharger Flow Information

Flow:	6 MGD
cBOD5:	45 mg/l
TKN:	40 mg/l
D.O.:	0 mg/l
Temperature:	23 Degrees C

Geographic Information

Segment Length:	3.5 miles
Upstream Drainage Area:	0 Sq.Mi.
Downstream Drainage Area:	0 Sq.Mi.
Upstream Elevation:	1710 Ft.
Downstream Elevation:	1690 Ft.

Hydraulic Information

Segment Width:	500 Ft.
Segment Depth:	2.372 Ft.
Segment Velocity:	0.785 Ft./Sec.
Segment Flow:	602 MGD
Incremental Flow:	0 MGD (Applied at end of segment.)

Channel Information

Cross Section:	Rectangular
Character:	Moderately Meandering
Pool and Riffle:	Yes
Percent Pools:	95
Percent Riffles:	5
Pool Depth:	2.5 Ft.
Riffle Depth:	0.5 Ft.
Bottom Type:	Gravel
Sludge:	None
Plants:	None
Algae:	None

REGIONAL MODELING SYSTEM VERSION 3.2

MODEL SIMULATION FOR THE Christiansburg DISCHARGE

TO New River

8 MGD
BOD = 45 mg/L
TKN = 40 mg/L
D.O. = 0 mg/L

COMMENT: Christiansburg at 8 MGD max BOD limit (45 mg/L)

THE SIMULATION STARTS AT THE Christiansburg DISCHARGE

********** PROPOSED PERMIT LIMITS **********

FLOW = 8 MGD cBOD5 = 45 Mg/L TKN = 40 Mg/L D.O. = 0 Mg/L

**** THE MAXIMUM CHLORINE ALLOWABLE IN THE DISCHARGE IS 0.836 Mg/L ****

THE SECTION BEING MODELED IS 1 SEGMENT LONG
RESULTS WILL BE GIVEN AT 0.1 MILE INTERVALS

********** BACKGROUND CONDITIONS **********

THE 7Q10 STREAM FLOW AT THE DISCHARGE IS 600.00000 MGD
THE DISSOLVED OXYGEN OF THE STREAM IS 7.701 Mg/L
THE BACKGROUND cBODu OF THE STREAM IS 5 Mg/L
THE BACKGROUND nBOD OF THE STREAM IS 0 Mg/L

********** MODEL PARAMETERS **********

SEG.	LEN. - Mi	VEL. F/S	K2 1/D	K1 1/D	KN 1/D	BENTHIC Mg/L	ELEV. Ft	TEMP. ½C	DO-SAT Mg/L
1	3.30	0.604	2.927	0.300	0.150	0.000	1694.75	20.00	8.557

(The K Rates shown are at 20½C ... the model corrects them for temperature.)

********** RESPONSE FOR SEGMENT 1 **********

TOTAL STREAMFLOW = 608.0000 MGD
(Including Discharge)

DISTANCE FROM HEAD OF SEGMENT (MI.)	TOTAL DISTANCE FROM MODEL BEGINNING (MI.)	DISSOLVED OXYGEN (Mg/L)	cBODu (Mg/L)	nBODu (Mg/L)
0.000	0.000	7.600	6.415	2.108
0.100	0.100	7.606	6.395	2.105
0.200	0.200	7.611	6.376	2.102
0.300	0.300	7.616	6.356	2.098
0.400	0.400	7.622	6.337	2.095
0.500	0.500	7.627	6.318	2.092
0.600	0.600	7.632	6.299	2.089
0.700	0.700	7.637	6.280	2.086
0.800	0.800	7.642	6.261	2.082
0.900	0.900	7.647	6.242	2.079
1.000	1.000	7.652	6.223	2.076
1.100	1.100	7.657	6.204	2.073
1.200	1.200	7.661	6.185	2.070
1.300	1.300	7.666	6.166	2.067
1.400	1.400	7.670	6.148	2.064
1.500	1.500	7.675	6.129	2.060
1.600	1.600	7.679	6.110	2.057
1.700	1.700	7.683	6.092	2.054
1.800	1.800	7.688	6.073	2.051
1.900	1.900	7.692	6.055	2.048
2.000	2.000	7.696	6.037	2.045
2.100	2.100	7.700	6.018	2.042
2.200	2.200	7.701	6.000	2.039
2.300	2.300	7.701	5.982	2.036
2.400	2.400	7.701	5.964	2.033
2.500	2.500	7.701	5.946	2.030
2.600	2.600	7.701	5.928	2.026
2.700	2.700	7.701	5.910	2.023
2.800	2.800	7.701	5.892	2.020
2.900	2.900	7.701	5.874	2.017
3.000	3.000	7.701	5.856	2.014
3.100	3.100	7.701	5.838	2.011
3.200	3.200	7.701	5.821	2.008
3.300	3.300	7.701	5.803	2.005

****

REGIONAL MODELING SYSTEM Ver 3.2 (OWRM - 9/90)
03-08-1996 12:29:51

DATA FILE = CBURG3.MOD

****

REGIONAL MODELING SYSTEM VERSION 3.2

DATA FILE SUMMARY

****

THE NAME OF THE DATA FILE IS: CBURG3.MOD

THE STREAM NAME IS: New River
THE RIVER BASIN IS: New River
THE SECTION NUMBER IS: 1
THE CLASSIFICATION IS: pw

STANDARDS VIOLATED (Y/N) = N
STANDARDS APPROPRIATE (Y/N) = Y

DISCHARGE WITHIN 3 MILES (Y/N) = N

THE DISCHARGE BEING MODELED IS: Christiansburg

PROPOSED LIMITS ARE:
FLOW = 8 MGD
BOD5 = 45 MG/L
TKN = 40 MG/L
D.O. = 0 MG/L

THE NUMBER OF SEGMENTS TO BE MODELED = 1

7Q10 WILL BE CALCULATED BY: DRAINAGE AREA COMPARISON
THE GAUGE NAME IS: New River
GAUGE DRAINAGE AREA = 2752.9 SQ.MI.
GAUGE 7Q10 = 600 MGD
DRAINAGE AREA AT DISCHARGE = 2752.9 SQ.MI.

STREAM A DRY DITCH AT DISCHARGE (Y/N) = N
ANTIDEGRADATION APPLIES (Y/N) = Y

ALLOCATION DESIGN TEMPERATURE = 20 ½C

SEGMENT INFORMATION

SEGMENT # 1

SEGMENT ENDS BECAUSE: THE MODEL ENDS

SEGMENT LENGTH = 3.3 MI

SEGMENT WIDTH = 356 FT
SEGMENT DEPTH = 2.96 FT
SEGMENT VELOCITY = .66 FT/SEC

DRAINAGE AREA AT SEGMENT START = 2752.9 SQ.MI.
DRAINAGE AREA AT SEGMENT END = 2784.8 SQ.MI.

ELEVATION AT UPSTREAM END = 1702.8 FT
ELEVATION AT DOWNSTREAM END = 1686.7 FT

THE CROSS SECTION IS: WIDE SHALLOW ARC
THE CHANNEL IS: MODERATELY MEANDERING

POOLS AND RIFFLES (Y/N) = Y
THE SEGMENT LENGTH IS 60 % POOLS
POOL DEPTH = 4 FT
THE SEGMENT LENGTH IS 40 % RIFFLES
RIFFLE DEPTH = 1.4 FT

BOTTOM TYPE = LARGE ROCK
)DGE DEPOSITS = NONE
AQUATIC PLANTS = NONE
ALGAE OBSERVED = VISIBLE ONLY ON EDGES
WATER COLORED GREEN (Y/N) = N

****

REGIONAL MODELING SYSTEM Ver 3.2 (OWRM - 9/90)
03-08-1996 12:29:56

APPENDIX J

THREATENED AND ENDANGERED SPECIES SCREENING

Coordination Document to DGIF, DCR, USFWS

DCR comments and DEQ response

DGIF comments and DEQ response

VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY

VPDES PERMITS

Threatened and Endangered Species Coordination

To:

- ☒ DGIF, Environmental Review Coordinator
- ☒ DCR
- ☒ USFWS, T/E Review Coordinator

From: Bob Tate, Blue Ridge Regional Office
540-562-6774
bob.tate@deq.virginia.gov

Date Sent: February 23, 2010

Permit Number: VPDES VA0061751

Facility Name: Christiansburg WWTF

Contact: Dennis Fisher

Phone: 540-382-8221

Address: 100 East Main Street
Christiansburg, VA 24073

Location: near Crab Creek confluence with New River

USGS Quadrangle: Radford North

Latitude/Longitude: 37/8/51 & 80/31/33

Receiving Stream: New River

Receiving Stream Flow Statistics used for Permit: very conservative – may change
1Q10 (acute) – 723 cfs
7Q10 (chronic) – 892 cfs

Effluent Characteristics and Max Daily Flow:

typical domestic sewage
currently @ 4 MGD design flow
6 MGD design flow expected soon
have asked for 8 MGD tier in next permit

Species Search Results:

DCR report submitted 2/23/10
DCR overview attached
VaFWIS report search attached

Note: I was recently informed that biosolids fields are to be reviewed for T&E species. The Christiansburg WWTF land applies treated sewage sludge (biosolids). All biosolids fields were previously approved. There is to be no discharge from fields to streams. Considering that (a) fields are spread over a relatively large area, (b) fields were previously approved, and (c) there is to be no discharge to streams, searching for aquatic T&E species appears to be of questionable value for the time it would require. I can forward field site information if interested.

Attach draft permit effluent limits page if available.
DGIF email: projectreview@dgif.virginia.gov
USF&W fax: (804)693-9032

VaFWIS Search Report Compiled on 2/23/2010, 9:22:27 AM

Help

Known or likely to occur within a **2 mile radius of null**
(at 37,08,51.0 80,31,32.7)
in **121 Montgomery County, 155 Pulaski County, 750 Radford City, VA**

153 Known or Likely Species ordered by Status Concern for Conservation
(displaying first 20) (10 species with Status* or Tier I**)

BOVA Code	Status*	Tier**	Common Name	Scientific Name	Confirmed	Database(s)
010214	FESE	I	Logperch, Roanoke	Percina rex		BOVA
070118	FSSE	II	Crayfish, Big Sandy	Cambarus veteranus		BOVA
010127	FSST	II	Madtom, orangefin	Noturus gilberti		BOVA
060081	ST	II	Floater, green	Lasmigona subviridis		BOVA,HU6
060140	ST	IV	Mussel, pistolgrip	Tritogonia verrucosa	Yes	Collections,HU6
010110	FS	III	Jumprock, bigeye	Moxostoma ariommum		BOVA
070010	FS	III	Amphipod, James Cave	Stygobromus abditus		BOVA

010174	SS	II	Bass, Roanoke	Ambloplites cavifrons		BOVA
010199	SS	II	Darter, candy	Etheostoma osburni		BOVA,HU6
020020	SS	II	Hellbender, eastern	Cryptobranchus alleganiensis alleganiensis	Yes	Collections,BOVA,HU6
020011		II	Frog, mountain chorus	Pseudacris brachyphona		BOVA,HU6
010097		III	Minnow, Kanawha	Phenacobius teretulus		BOVA,HU6
020021		III	Mudpuppy, common	Necturus maculosus maculosus		BOVA
060145		III	Mussel, notched rainbow	Villosa constricta		BOVA
010038		IV	Alewife	Alosa pseudoharengus		BOVA
010363		IV	Darter, Appalachia	Percina gymnocephala		BOVA,HU6
010200		IV	Darter, riverweed	Etheostoma podostemone		BOVA
010212		IV	Darter, sharpnose	Percina oxyrhynchus	Yes	Collections,BOVA,HU6
010131		IV	Eel, American	Anguilla rostrata	Yes	Collections,BOVA
010207		IV	Logperch	Percina caprodes		HU6

To view **All 153 species** View 153

* FE=Federal Endangered; FT=Federal Threatened; SE=State Endangered; ST=State Threatened; FP=Federal Proposed; FC=Federal Candidate; FS=Federal Species of Concern; SC=State Candidate; CC=Collection Concern; SS=State Special Concern

** I=VA Wildlife Action Plan - Tier I - Critical Conservation Need; II=VA Wildlife Action Plan - Tier II - Very High Conservation Need; III=VA Wildlife Action Plan - Tier III - High Conservation Need; IV=VA Wildlife Action Plan - Tier IV - Moderate Conservation Need

View Map of All Query Results from All Observation Tables

Anadromous Fish Use Streams

N/A

Impediments to Fish Passage

N/A

Colonial Water Bird Survey

N/A

Threatened and Endangered Waters

N/A

Cold Water Stream Survey (Trout Streams)
Managed Trout Species

N/A

Scientific Collections (29 records - displaying first 20 , 3 Collections with Threatened or Endangered species)

View Map of All Query Results Scientific Collections

Collection	Date Collected	Collector	Collection Species			View Map
			Different Species	Highest * TE	Highest ** Tier	
318817	Aug 6 2007	John Alderman	3	ST	IV	Yes

320955	Oct 3 2008	John Copeland, VDGIF	1	SS	II	Yes
20831	Jan 1 1900		1	SS	II	Yes
602161	Jul 13 2009	Karen Francl	1			Yes
309039	Jul 27 2004	PAUL L. ANGERMEIER (PRINCIPLE PERMITTEE), VARIOUS COLLECTORS	15			Yes
308300	Jul 15 2004	Alex Barron	5			Yes
308297	Jun 17 2004	Alex Barron	3			Yes
315123	Nov 3 2003	DEQ	3		IV	Yes
315082	Mar 18 2003	DEQ	2			Yes
315081	Mar 10 2003	DEQ	4		IV	Yes
67890	Oct 2 2001	Rick Browder (Principle Permittee)	4			Yes
300274	Jan 24 2001	Travis Brenden	1			Yes
64817	Jul 10 2000	ALEX BARREN (PRINCIPLE PERMITTEE) AND RICK BROWDER, (COLLECTOR), VA DEQ	4			Yes
315629	Apr 26 2000	Travis Brenden	1			Yes
306990	Sep 8 1998	Pinder, Mike; DGIF crew	5		IV	Yes
306960	Aug 6 1998	Pinder, Mike; DGIF crew	17		IV	Yes
58956	Jun 28 1998	RICHARD NEVES (PRINCIPLE PERMITTEE) AND SUSAN O. ROGERS, VA TECH	1			Yes
10731	Jun 12 1971	Benfield, Boaze, Dickson, and Hendricks	10			Yes
10730	Jun 10 1971	Benfield, Boaze, Dickson, and Hendricks	11			Yes
32662	Jan 1 1970	SKW-WHITT	3			Yes

To view **All 29 Collections** View 29

Virginia Breeding Bird Atlas Blocks

N/A

USFWS Breeding Bird Survey Routes

N/A

Christmas Bird Count Survey

N/A

Public Holdings: (1 names)

Name	Agency	Level
Radford Army Ammunition Plant #2	U.S. Dept. of Army	Federal

Summary of BOVA Species Associated with Cities and Counties of the Commonwealth of Virginia:

FIPS Code	City and County Name	Different Species	Highest TE	Highest Tier
121	Montgomery	549	FESE	I
155	Pulaski	457	FESE	I
750	Radford City	451	FSST	I

USGS 7.5' Quadrangles:

Radford South
Radford North
Riner
Blacksburg

USGS NRCS Watersheds in Virginia:
N22 - NEW RIVER/TOMS CREEK/BACK CREEK/STROUBLES CREEK
N18 - NEW RIVER/CRAB CREEK

USGS National 6th Order Watersheds Summary of Wildlife Action Plan Tier I, II, III, and IV Species:

HU6 Code	USGS 6th Order Hydrologic Unit	Different Species	Highest TE	Highest Tier
NE57	New River-Connellys Run	80	FESE	I
NE58	Crab Creek	63	FESE	I
NE59	New River-Stroubles Creek	78	FESE	I

Terrestrial GAP project

17 GAP Habitat types identified within 8074 acres evaluated

Area	Gap Habitat Type
21%	Mixed Class/Unknown
15%	Dry Deciduous Forest
15%	High Herbaceous/Field Crop
12%	Mesic Deciduous Forest
10%	Montane Oak Dominated
6%	High Intensity Developed
6%	Open Water
6%	Mixed Herbaceous
4%	Residential/Low Intensity Developed
1%	Non-Vegetated (mines, barren, etc.)
1%	Montane Yellow Pine
<1%	Mixed Central Hardwoods
<1%	Montane Mesic Conifer
<1%	Montane Dry Oak Dominated
<1%	Recent Clear Cut
<1%	Pasture/Low Herbaceous
<1%	Sparse Herbaceous/Row Crop

74 Species designated "Under Represented in Protected Areas" associated with GAP Habitat Types

336 Species associated with GAP Habitat Types

COMMONWEALTH of VIRGINIA

DEPARTMENT OF CONSERVATION AND RECREATION

Division of Natural Heritage

217 Governor Street

Richmond, Virginia 23219-2010

(804) 786-7951 FAX (804) 371-2674

March 18, 2010

Bob Tate
DEQ-WCRO
3019 Peters Creek Road
Roanoke, VA 24019

Re: VA0061751, Christiansburg WWTP

Dear Mr. Tate:

The Department of Conservation and Recreation's Division of Natural Heritage (DCR) has searched its Biotics Data System for occurrences of natural heritage resources from the area outlined on the submitted map. Natural heritage resources are defined as the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations.

According to the information currently in our files, the Hellbender (*Cryptobranchus alleganiensis*, G3G4/S2S3/NL/SC) has been historically documented in the New River. The Hellbender, a large aquatic salamander, prefers larger, clear, and fast-flowing streams of the Mississippi drainage (Martof, et. al, 1980). The Hellbender requires cover in the form of flat rocks. Threats to this species include habitat alteration from impoundments and water pollution (Pague, 1991). Please note that this species is currently classified as a special concern species by the Virginia Department of Game and Inland Fisheries (VDGIF); however, this designation has no official legal status.

To minimize impacts to aquatic resources, DCR recommends the use of uv/ozone to replace chlorination disinfection and utilization of new technologies as they become available to improve water quality.

Our files do not indicate the presence of any State Natural Area Preserves under DCR's jurisdiction in the project vicinity.

Under a Memorandum of Agreement established between the Virginia Department of Agriculture and Consumer Services (VDACS) and the Virginia Department of Conservation and Recreation (DCR), DCR represents VDACS in comments regarding potential impacts on state-listed threatened and endangered plant and insect species. The current activity will not affect any documented state-listed plants or insects.

New and updated information is continually added to Biotics. Please contact DCR for an update on this natural heritage information if a significant amount of time passes before it is utilized.

The Virginia Department of Game and Inland Fisheries maintains a database of wildlife locations, including threatened and endangered species, trout streams, and anadromous fish waters that may contain information not documented in this letter. Their database may be accessed from http://vafwis.org/fwis/ or contact Shirl Dressler at (804) 367-6913.

Should you have any questions or concerns, feel free to contact me at 804-371-2708. Thank you for the opportunity to comment on this project.

Sincerely,

S. Rene' Hypes
Project Review Coordinator

Literature Cited

Martof, B.S., W.M. Palmer, J.R. Bailey, and J.R. Harrison III. 1980. Amphibians and reptiles of the Carolinas and Virginia. University of North Carolina Press. Chapel Hill, North Carolina.

Pague, C.A. 1991. Hellbender. In Virginia's Endangered Species: Proceedings of a Symposium. K. Terwilliger ed. The McDonald and Woodward Publishing Company. Blacksburg, Virginia.

Tate, Robert (DEQ)

From: Tate, Robert (DEQ)
Sent: Thursday, March 25, 2010 10:26 AM
To: 'nhreview nhreview'
Subject: RE: VA0061751, Christiansburg, WWTP

Ms. Hypes,

After reading the DCR-DNH comments and conversing with you on the phone today, I understand that your concern is possible chlorine disinfection. The Christiansburg WWTP uses ultraviolet light disinfection.

Don't hesitate to contact me for further assistance.

Bob Tate
water permit writer
DEQ-BRRO
540-562-6774

-----Original Message-----
From: nhreview nhreview [mailto:nhreview@dcr.virginia.gov]
Sent: Thursday, March 18, 2010 12:13 PM
To: Tate, Robert (DEQ)
Subject: VA0061751, Christiansburg, WWTP

Mr. Tate,

Please find attached the DCR-DNH comments for the above referenced project. The comments are in pdf format and can be printed for your records. Also species rank information is available at http://www.dcr.virginia.gov/natural_heritage/help.shtml for your reference.

Please send a confirmation e-mail upon receipt of our comments. Let us know if you have any questions.

Thank you for your request.

Rene'

S. Rene' Hypes
Project Review Coordinator
DCR-DNH
217 Governor Street
Richmond, Virginia 23219
804-371-2708 (phone)
804-371-2674 (fax)
Rene.Hypes@dcr.virginia.gov

Tate, Robert (DEQ)

From: Aschenbach, Ernie (DGIF)

Sent: Thursday, March 11, 2010 2:18 PM

To: Tate, Robert (DEQ)

Cc: Kittrell, Bill (DGIF); ProjectReview (DGIF)

Subject: ESSLog# 30623; biosolids application at multiple sites near Radford and Christiansburg, Virginia

We have reviewed the above-referenced VPDES permit for biosolids application at multiple sites near Radford and Christiansburg, Virginia.

The following resources are known from the project area:

Sites: 1, 2, 3, 4, and 6: According to our records, no listed wildlife resources under our jurisdiction have been documented from the project area.

Site 8: Big Laurel Creek, a designated wild trout water containing brown trout, is within the project area. Prior to application at this site, we recommend contacting Bill Kittrell, DGIF Region III Fisheries Manager (telephone (276) 783-4860), for further guidance regarding the protection of wild trout waters.

In order to protect aquatic resources we recommend application of biosolids not occur within a 100 m buffer of all waterbodies, including but not limited to wetlands, Big Laurel Creek, the New River and/or its tributaries. We recommend strict adherence to E&S controls.

Thank you for the opportunity to provide comments.

Ernie Aschenbach
Environmental Services Biologist
Virginia Dept. of Game and Inland Fisheries
4010 West Broad Street
Richmond, VA 23230
Phone: (804) 367-2733
FAX: (804) 367-2427
Email: Ernie.Aschenbach@dgif.virginia.gov

Tate, Robert (DEQ)

From: Tate, Robert (DEQ)

Sent: Friday, April 16, 2010 1:56 PM

To: Aschenbach, Ernie (DGIF)

Subject: DGIF comments on threatened and endangered species screening

The following is DEQ's response to comments received from DGIF on March 11, 2010 concerning threatened and endangered species screening for reissuance of VPDES Permit VA0061751 for the Town of Christiansburg's WWTP.

Responses will follow the pattern of your March 11 e-mail.

Sites 1, 2, 3, 4, and 6: no response(s) needed

Site 8: Big Laurel Creek, a designated wild (brown) trout water, is beyond the one-mile search radius in the proposed Memorandum of Understanding for biosolids land application sites. Furthermore, Big Laurel Creek joins the Little River more than two miles upstream of site 8. How can a biosolids land application site more than two miles downstream of a natural trout stream can be a concern to DGIF? Contacting DGIF's Region III Fisheries Manager prior to application at site 8 appears to be unnecessary and unproductive.

Establishing a buffer of 100 meters around all waterbodies, including wetlands, has no regulatory basis. 9 VAC 25-332-560.B.3.d establishes buffer requirements of:

10 feet for agricultural drainage ditches with slopes no more than 2.0%;
25 feet for intermittent steams and drainage ditches (50 feet in winter);
50 feet for perennial steams and other surface waters (100 feet in winter);
100 feet for water supply wells and springs.

The permittee has the option of implementing an extended buffer.

Strict adherence to erosion and sediment controls is appropriate.

Do not hesitate to contact me regarding these matters. Previous attempts to discuss DGIF's concerns resulted in three voice messages left at 804-367-2733. Apparently these calls were not returned.

Bob Tate
water permit writer
DEQ-BRRO
3019 Peters Creek Road
Roanoke, VA 24019
(540) 562-6774